
Computer Application Theory

CHAPTER 4

Computer Communication

INTRODUCTION

Communication is the basic requirement of mankind. If people are nearby they communicate verbally. If they are far away, they adopt some means for communication. For example, in ancient days people used to light fire and blow smoke or beat drums for giving signals of their well being to their friends and relatives, who lived at some distance from them. When man became bit civilized, he moved to more distantly located places, places where smoke signals or drum sounds could not reach. So he started sending messages through pigeons or human-runners.

Later when distances between people became large, services like Post and Telecommunication came into existence for communicating with others. Both the services exist even today. No doubt these services are quite useful but they have their own disadvantages. Postal service is quite slow. For example, a letter sent from India to USA may take 15 to 20 days. By the time it reaches its destination, complete scenario changes. In addition to this, letters get lost in transit. On the other hand, telecommunication services are fast but are limited to voice chat only. Articles like documents, letters etc. cannot be transferred through this service. In addition to this, it is a costly service. In spite of so many disadvantages, Post and Telecommunication services enjoyed their popularity for many decades, as there was no substitute for these services.

With the advent of computer networking technology and popularity of Internet, computer communication emerged as substitute for both the services. It works as base line for many new services, which have come into existence recently. Electronic Data Interchange (EDI), E-Commerce, Electronic Fund Transfer etc. are the latest services, which have completely changed the working methodologies of many organizations and have brought revolution in the society. All these services make use of computer communication. All important aspects related to computer communication are described in this chapter.

INTRODUCTION TO NETWORK

When two or more identities of similar type, work in coordination with each other,

performing similar types of tasks, they form a network. For example, when sales executives of an organization work together to sell the product of the company, they form company's sales network. Similarly when two or more computers are connected together to work in coordination with each other they form a computer network.

To form a computer network and establish coordination among the computers of the network, certain hardware and software elements need to be present in the network. For proper communication among them, certain rules of communication, called protocol, need to be established.

Resource sharing and instant data communication are the immediate results of a computer networking. Advantages of these two simple-looking factors are so many that in short span of time numerous computer networks have come into existence and millions of applications have been developed around them.

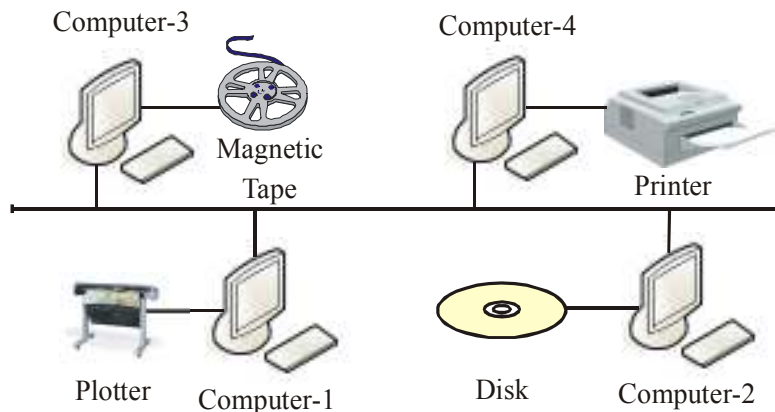


Figure 4.1

What computer network is, in what form its computers are arranged in the network, what protocols are used to establish communication among them, and what type of services are available on computer networks, are the issues, which are described below.

WHAT IS COMPUTER NETWORK

When two or more computers are connected together with the objective of communicating with each other and sharing their resources, they form a computer network. A simple computer network is illustrated in figure 4.1.

Refer figure 4.1 and note that 4 computers are connected together to form a computer network.

In this network, any computer can communicate with any other computer. For example, computer-1 can send message to computer-4 and computer-4 can reply back. Similarly computer-2 and computer-4 can exchange data among them.

In computer network, computers share their resources among them. For example, computer-3 can print its documents on the printer attached to computer-4. Similarly computer-1, computer-3 and computer-4 can store their data on computer-2's disk.

REASONS FOR NETWORKING

There are many factors that have brought computer networking into existence. These factors are described below.

To Share Distant Devices

Although the cost of low end computers has drastically reduced but the prices of high end computers and some of the peripherals are still very high. For example, magnetic tape drives, optical disks, line printers, color laser printers etc. are still priced high. It is quite obvious that they cannot be purchased for every individual computer of the organization. If it is done so, it will be highly uneconomical proposition. Best means for making these costly devices available to each computer, is to network the computers and allow the users (of other computers) to use them through network. The concept of distant device sharing is illustrated in figure 4.2.

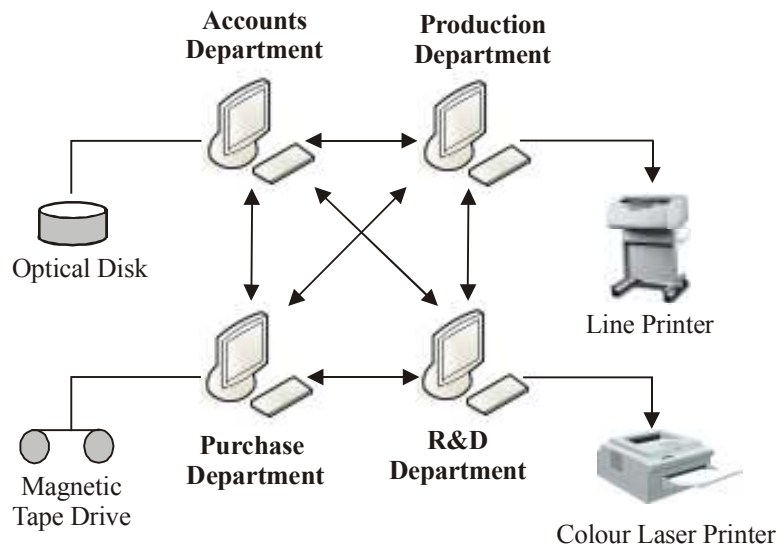


Figure 4.2

Figure 4.2 clearly shows that departments have purchased costly items such as optical disk, color printer etc. as per their own internal requirements. But their use is not limited to their departments only. Users of other departments can also access them over the network. For example, Production department does not have a color laser printer but can print its colored pictures on R&D's color laser printer by accessing it through network. Similarly R&D department can access optical disk of Account's department for either storing or retrieving its files.

To Share Software of Other Installations

If an organization has multiple locations then multiple copies of the software need not be purchased and installed at every location, instead a single copy can be purchased and installed at one computer and made accessible to the users of other computers also. This would not only save the cost but save the disk space also.

To Share Data Of Other Installations

As described above, when you wish to access data of other computers, on-line, you have to

network the computers. For example, a computer based at Delhi railway reservation cell may have reservation related data of all the trains that originate from Delhi.

Similarly Mumbai railway reservation cell may have reservation related data for all the trains that originate from Mumbai.

Railway reservation software may use this information to book the seats for the passengers locally i.e. people based at Delhi can book their seats in the trains that originate from Delhi. Similarly Mumbai people may be able to book their seats in the trains originating from Mumbai. But if they wish to provide return reservation facility (i.e. person sitting at Delhi is able to book the seats in the trains originating from Mumbai) then both the computers have to be networked. Concept of remote data access is clearly shown in figure 4.3 and 4.4.

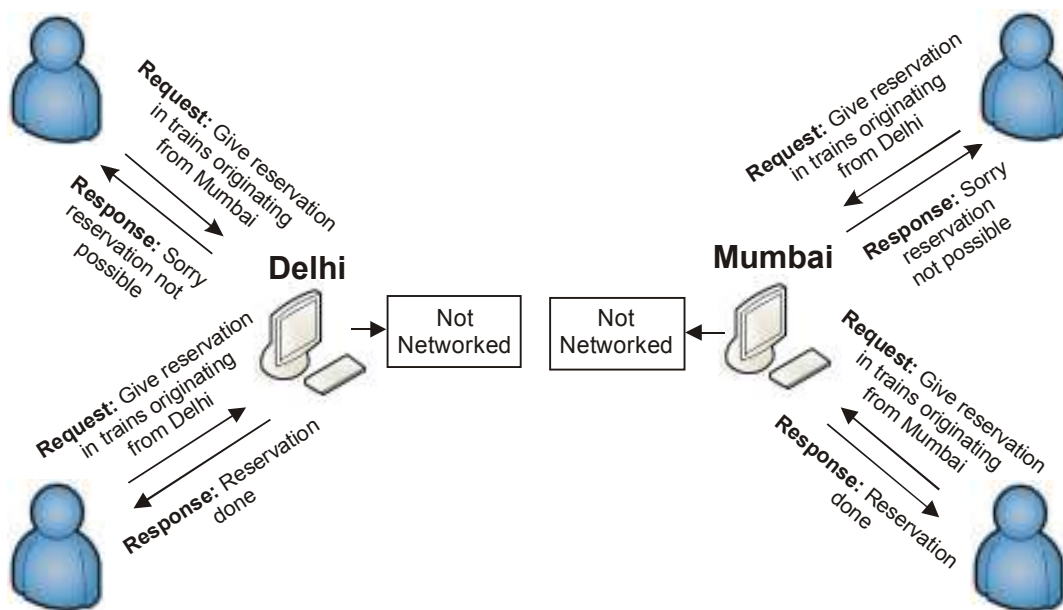


Figure 4.3

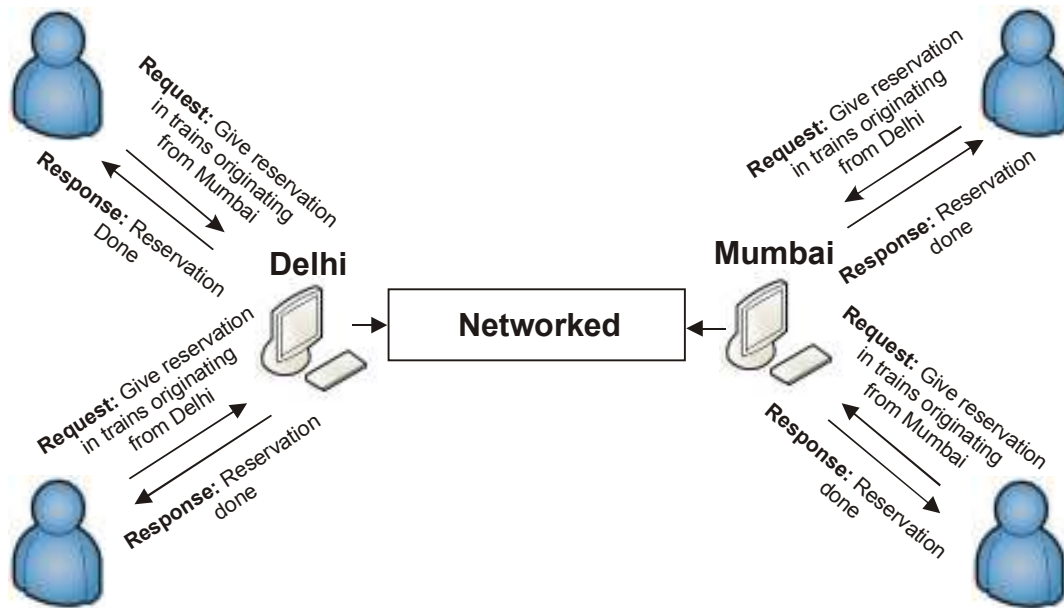


Figure 4.4

To Provide a Communication Medium

When the users are situated at different locations, they need to communicate with each other for various reasons. When computers are networked, users of different computers can send messages to each other and communicate. Electronic Mail is an example of network applications that saves cost and time, both. Chat or video conferencing can also be held among the users of network.

To Evenly Distribute the Load of Processing

When the total job volume is high then it is better to distribute the work and interconnect the sites so that the job volume is evenly distributed and there is no problem in handling the resources. For example, one computer may be completely dedicated to data entry, another may be dedicated to data processing, and the other may be dedicated to data analysis and printing. To run the jobs in parallel they may be networked together.

APPLICATIONS OF NETWORK

As you know, data communication and resource sharing are the two prime outcomes of computer networking. Taking advantages of these two outcomes computer network serves as base line for many applications. Many products and services that have come into existence in recent past make use of computer network. Few famous applications of computer network are described below.

Rail/Air Reservation System

Railway department has its own computer network. All major cities of India are connected together through this network. For example, railway computers of all major cities like Delhi, Mumbai, Kolkatta, Chennai, Bangalore, Madurai, Hyderabad and many more are networked together for data communication and resource sharing.

Rail reservation system has been developed for railway computer network. Since all the computers are connected together hence they can share train related data among them. For example, computer at Chennai can read, write and delete data that is present on Mumbai computer. This is the reason why back reservations can be done and tickets printed for the journey from Mumbai to Chennai, sitting at Chennai (in fact for any train from any city that is on railway network). Similar types of reservations are done for flights, all across the globe. For example, I can book a ticket in a flight that originates from France and goes to New York, sitting in India.

Internet Banking & ATMs

There was a time when banking operations (like depositing and withdrawing money from account) were quite local to the city, in which the customer had his account. For example, it was not possible for any customer to withdraw money from his Delhi bank account, while he was in Chennai. But now computer network has made this possible.

Computers of all major banks in all major cities are networked together. Automatic Teller Machines (ATM) are also connected to network. May customer's account be anywhere, it can be accessed from any part of the country (some privileged accounts can also be accessed from any part of the world) and money transactions be done.

Due to networking outstation cheques are cleared in a day or so. Accounts are settled within few hours.

E-Mail

Electronic mail is one of the most popular applications of computer network. Using this application, letters, document, reports etc. are exchanged between people, over network. The biggest advantage of e-mail is that the sent articles reach their destination within few seconds. In addition to this, they do not get lost in transit.

Information Sharing Applications

Many organizations, libraries, universities, scientific labs etc. have their own computer networks. Using network they share information with each other. For example, library networks allow librarians to search the availability of a book in other libraries that is in demand and is not present in their library.

Similarly computer networks of universities provide facilities and means for gathering information on research papers, journals, and published articles, which are available in other universities.

Offices and organizations that have their own computer network, (computer of which may

be in the same premises or different cities or countries), share official information through computer network. Managers pass instructions to their subordinates through computer network. All required data or reports are transacted through computer network.

Education And Examinations

These days, computer networks are being used for providing distant education through on-line classes and conducting remote examinations. Education provider may be distantly located but he makes his presence at many places through networked computers.

Classes, course material, exercises and examination papers etc. are made available centrally at one place. Other users access them through network and use them for their benefit. On-line universities are example of this application.

Network Games

These days, many computer network games are available, in which distantly located network users play a common game. Imagine a car race game, in which persons located in Chennai, Mumbai and Delhi participate in a car race and try to compete with each other to win the race.

BENEFITS OF NETWORKING

By inter connecting the computers in the form of network; you draw lot of advantages, which otherwise, in central or decentralized type of setup, are not possible. A list of important advantages of networking is given below.

1. By networking the computers, you can access the information, available at distant locations within no time, which otherwise would have not been available so quickly and effortlessly.
By having fast access to the data/information you can react fast to the on-going problems and take fast decisions and save time, money and energy.
2. You can share costly devices and thus cut upon cost and utilize the resources in much better and effective way.
3. You can keep the work going, even if one of the computers is not working. If one computer is down, you can use another computer till the time fault is corrected. Thus by networking the system you are able to utilize the time and resources in very effective way.
4. You can design much better applications, which provide great help and services to its users. For example, only due to networking it has been made possible to book the air or railway tickets for any destination from any city present on the network.
5. You are able to communicate with other users in much better way. For example, even if the user is not available on-line, you can send him mail, which gets stored in his mail box. When he logs on and starts using computer, he is informed of new mail arrivals so if he wishes he can look into those letters.
6. An on-line advice can be sought from the experts for solving the current crisis, for which you do not have ready-made solution with you.

TYPES OF NETWORKS

Computer networks are broadly classified into two categories:

1. Local Area Networks (LAN).
2. Wide Area Networks (WAN).

Other networks are variations of these two networks. A detailed, description of both types of networks is given below.

Local Area Network

Local area networks are the networks that spread within a short distance of a kilometer or so and are generally confined to a building or a campus. For example, computers of various departments of an organization that confine within the factory building itself, if connected together, will form a Local Area Network.

The data transfer speed of Local Area Network is generally high i.e. large amount of data can be transferred from one computer to the other in a very short span of time. Roughly the data transfer rate in LANs is generally of the order of Mega bits per second (MBPS). In Local Area Networks you connect the computers using dedicated wires of your own which are only used for transferring the data/information and are not used for any other purpose. Since these communication lines run, in private, undisturbed area hence LANs are relatively error free. (For example, 1 bit error in 10^9 bits transmitted). A rough sketch of Local Area Network is illustrated in figure 4.5.

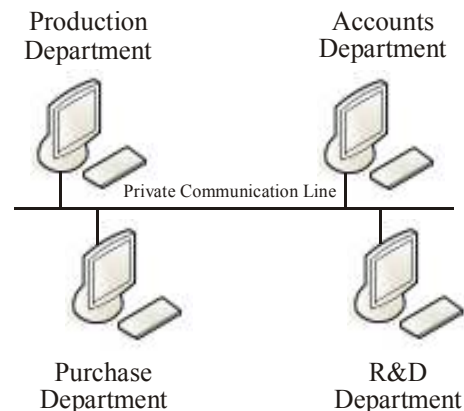


Figure 4.5

Wide Area Networks

Wide Area Networks or WAN are the networks, in which computers are spread over long distances (more than a kilometer). Computer of Wide Area Network could either be in different countries, cities or localities. Since they spread over wide geographical area hence you cannot connect them through your own lines. You have to take help of the connections, which already exist in one form or the other. For example, telephone connection is one type of link that is already available in ready-made form. It can be used to connect the computers, which are far apart. Similarly microwave link and satellite link are other types of links that can be used to connect the computers that are in remote locations or are situated across the countries.

Note that these ready-made links were originally designed for some other purpose not for connecting computers, so their transfer speeds are not as high as that of dedicated lines (LAN lines). Roughly their speed is of the order of few Kilo bits per second say 32 Kbps or 64 Kbps.

Since these lines run into noisy environment where humidity, heat and electrical signals cannot be controlled hence Wide Area Networks are more error prone than Local Area Networks (For example a

bit error rate of 1 in 100,000 bits transmitted). A rough sketch of Wide Area Network is illustrated figure 4.6.

VARIATIONS OF LAN AND WAN

Various variations of Local Area Network and Wide Area Network exist with different names. Some of them are described below.

Campus Area Network (CAN)

When the computer of various departments of an organization, such as factory, college, university etc. are connected together. They form Campus Area Network or CAN in short. Since computers of Campus Area Network remain confined within the campus boundary (which is short) hence they fall into the category of LAN.

Metropolitan Area Networks (MAN)

Metropolitan Area Networks are basically Wide Area Networks, which connect computers of larger cities. They are generally high-speed networks and work as backbone for connecting other local area networks (say smaller cities, which are located between two big cities of MAN). A block diagram of Metropolitan Area Network is shown in figure 4.7.

Home Area Network (HAN)

When two or more computers located within a house are networked together, they are given the name Home Area Network or HAN in short. Obviously HAN falls into the category of Local Area Network.

NETWORK TOPOLOGIES

Topology is basically the physical arrangement of computers in the network. There are various topologies, suggested for computer networks. Each topology has its own advantages and disadvantages. One topology suits well for one set of given conditions while the other doesn't. Some of the topologies undergo network expansion easily while other may require complete overhauling. A complete overview of most commonly used topologies is given below.

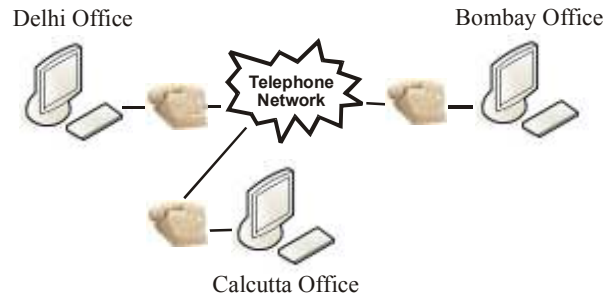


Figure 4.6

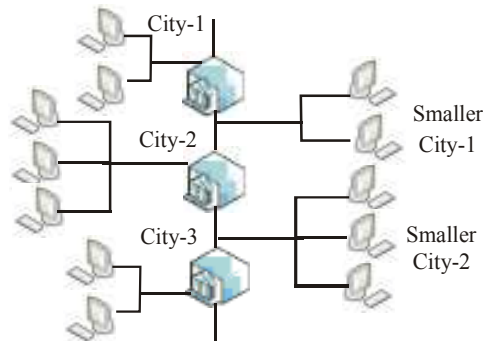


Figure 4.7

Bus Topology

In bus topology, all the computers and devices of the network are connected to common medium (cable). Both the ends of the medium are terminated by a special device called terminators. Computers are connected to the cable, using other device called T connector. Block diagram of bus topology is illustrated in figure 4.8.

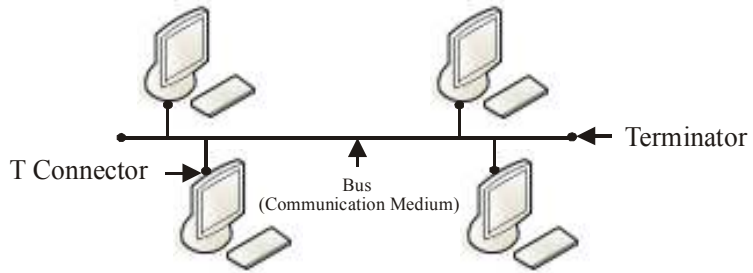


Figure 4.8

Functioning

Any computer that wants to communicate with other computer includes its address in the message and transmits it on the medium. Every computer receives the message. If any computer finds its own address in the message, it picks up the message else it rejects it. In this way, the communication takes place between the computers of the network.

Advantages

Following are the advantages of bus topology:

1. It requires shortest length of wire to connect the computers of the network in comparison to the wire required in other topologies.
2. Adding and removing the computers in the network is easy. It does not affect other computers of the network.
3. Even if one computer of the network becomes down, it doesn't affect the functioning of other computers. The network keeps on functioning.

Disadvantages

Following are the disadvantages of bus topology:

1. Terminators often malfunction, due to loose connections.
2. A failure in the cable makes the entire network down.

Ring Topology

In ring topology computers of the network are connected to each other in circular fashion. The first computer is connected to the second computer, second is connected to the third and so on and the last computer is connected to the first computer, so as to complete the circle. Computers of the network are connected to the cable, using a special device called repeater. A computer network, in ring topology is illustrated in figure 4.9.

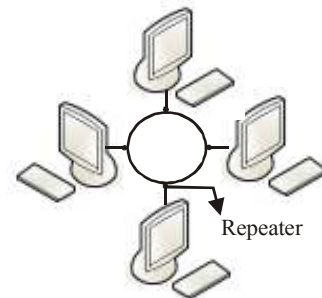


Figure 4.9

Functioning

In this type of topology, a bit pattern, called token, keeps on moving from one computer to another in circular fashion. Only that computer, which has the token, is allowed to transmit the message.

Transmitting computer introduces destination computer's address in the message and pushes it on the medium. The message moves forward in one direction, on the medium. When a computer receives the message it checks the destination address. If the destination address matches with its own address it picks up the message else it rejects it.

After transmitting the message on the medium, computer passes the token to next computer to communicate.

Advantages

Practically there are no highlights of this topology but there are lots of disadvantages.

Disadvantages

Following are the disadvantages of ring topology:

1. Malfunctioning in any of the repeater or cable makes the entire network down.
2. Addition and removal of computers in/from the network is a difficult task.
3. Long cables are required to connect the computers.
4. This type of network cannot be expanded beyond a limit. Not many computers can be added in this arrangement.

Star Topology

In star topology, computers of the network are connected together through a special device called hub. Each computer is connected to the hub. Thus the link of one computer is established with other computers via hub. A computer network in star topology is illustrated in figure 4.10.

Functioning

Hub in this topology works as intelligent switch. When a computer wish to transmit a message it introduces destination computer's address in it and pushes the message, on the link, that joints it to the hub.

On receiving the message, hub checks the address and routes it to the computer, to which the message has been sent. In this way, proper communication between the two computers of the network gets established.

Advantages

1. Hub provides mechanism for connecting many computers to the network. So

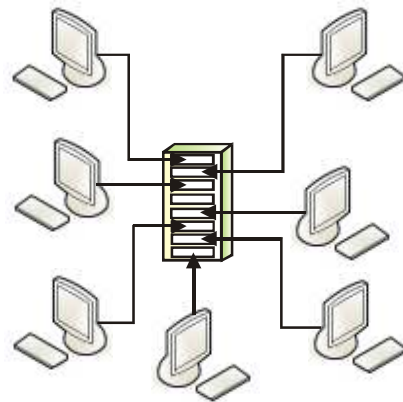


Figure 4.10

expansion of the network becomes very easy, if a slot is vacant in the hub. If all the hub slots are occupied then another hub can be added into the network, so as to make provision for many more new slots. Thus network growth doesn't have any limitation in this type of topology.

2. If the link between the hub and a computer is down then it doesn't effect the functioning of other computers of the network. Rest part of the network works fine.
4. All the hubs generally have a status light for each link. Glowing light of a link indicates that the link is working fine. Thus identification of malfunctioning link, in this topology, becomes very easy.

Mesh Topology

In mesh topology each computer of the network remains connected with other computers through dedicated medium (wire). A computer network, in mesh topology, is illustrated in figure 4.11.

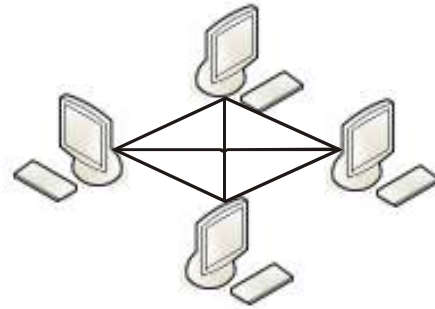


Figure 4.11

Functioning

Since direct path to every computer exists in this topology hence computer sends the message directly to the required computer.

When the link to a destination gets broken, computer sends the message to another computer introducing the address of the destination computer. On receiving the message, receiving computer directs it to the computer, to which the message belongs.

Advantages

Following are the advantages of mesh topology:

1. Due to direct connection between the computers, no switching is required. This makes the network very fast.
2. If one link gets broken, the data is routed through other links. Thus network seldom remains down.

Disadvantages

Following are the disadvantages of Mesh topology:

1. It doesn't suit well for large number of computers.
2. Very large length of cable is required to connect the computers, so the cost turns out to be very high.
3. This topology is almost obsolete now.

NETWORKING BASICS

Basic model of network communication is illustrated in figure 4.12. It shows that network comprises of following essential components:

1. Sender
2. Receiver
3. Medium
4. Message
5. Protocol

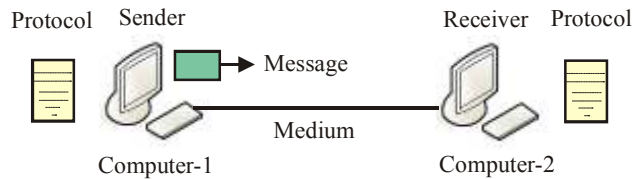


Figure 4.12

A brief description of each component is given below.

Sender

The computer, which sends the message (or starts the communication) is called sender. For example, if computer-1 sends message to computer-2 then computer-1 will be termed as sender.

Receiver

That computer of network, which receives the message is called receiver. For example, if computer-2 receives the message sent by computer-1 then computer-2 will be termed as receiver.

Medium

Medium is basically that substance through which message propagates and reaches the destination (receiver). For all practical purposes, medium could be of following two types:

1. Wired medium.
2. Non-wired medium.

Depending upon various factors, such as distance, type of message, price etc. communication medium may vary from network to network. A brief introduction of both types of medium is given below.

Wired Medium

When a cable is used for physically connecting the computers of the network the medium is said to be wired medium. Following types of cables are generally used for connecting the computers of the network.

Twisted Pair Cable

Two independently insulated wires twisted around one another form twisted pair cable. Often both the wires are encased within plastic case. Wires pick up electromagnetic signals from the atmosphere and thus noise gets created in the signal, passing through the wire. When two wires are wound over each other, noise in one wire destroys the noise in other. Thus twisting of wires helps in reducing cross talks. It is the cheapest cable. It can support up to 1Gbps data transmission speed. Twisted pair cable is illustrated in figure 4.13(a).

Coaxial Cable

Coaxial cable is basically a conducting wire surrounded by insulation material, like hard

plastic. Conducting sheath surrounds this assembly and the whole assembly is then encased within insulating plastic. It is used as high frequency transmission line to carry high frequency or broadband signals. Noise is reduced to bare minimum in such type of cables. The cable that comes to our home from local cable TV network is an example of coaxial cable. It supports data transmission up to 10 Mbps. A coaxial cable is illustrated in figure 4.13(b).

Optic Fiber Cable

Optic fiber consists of a very fine (as fine as hair) transparent fiber, usually made of glass or plastic. Light can pass through the fiber even if it is not straight.

Optic fiber cable consists of optic fiber enclosed within a rubber shield. Above it is placed braided copper or foil layer and the assembly is enclosed within jacket. An optic fiber cable is illustrated in figure 4.13(c).

In optic fiber cable data transmission takes place, using light. Light doesn't gather any type of noise from the atmosphere. Thus quality of the signal / message remains unchanged throughout the distance. Optic fiber cable support up to 100 Gbps data transfer rates.

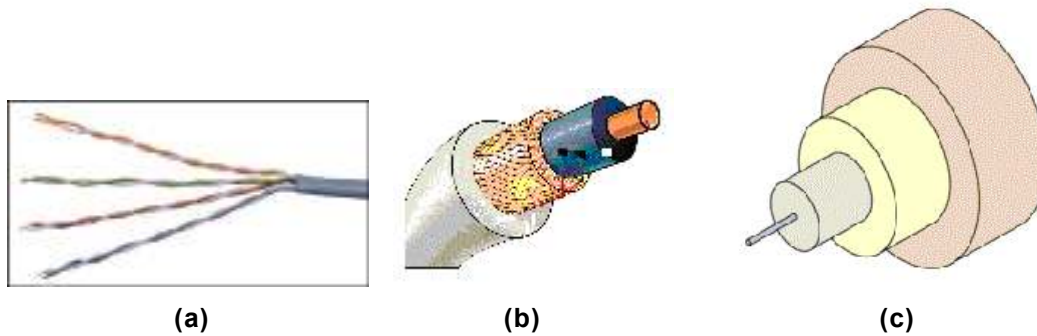


Figure 4.13

Non Wired Medium

The medium other than cable, which is used to transmit the message from one computer to another in a network, is called non-wired medium. Usually it is nothing other than air. Message from one computer, in the form of infrared waves or radio waves or high frequency waves passes through air and reaches other computer of the network. Thus a connection gets established among them.

This medium of communication is becoming popular day by day in computer networking. Wireless networking, including wireless Internet connectivity are very popular these days. LANs and WANs both are making use of this medium for computer connectivity.

Message

What travels from sender to receiver is called message. As an essential rule of communication, message should reach the destination in its original form. No deformation or manipulation should take place in the middle.

Protocols

A protocol is basically a set of standards that are decided between the sender and receiver for error free communication between them. A message, though received in its original form, is of no use, if receiver cannot understand the message.

For example, if the sender sends an encrypted message to the receiver and the receiver doesn't know that the message is in encrypted form, then in this case all the manipulations that are done at receiver's end, may lead to errors. Thus before communication starts, rules must be set that all the communication will be done in encrypted form and decryption has to be performed before the message is manipulated. It is quite obvious that if the rules of communication are set properly there will not be any problem in interpreting the message.

To understand the need and concept of protocol, consider a the smallest form of computer network, in which two computers say Com-1 and Com-2 are connected together, with the objective of communicating with each other. Say their addresses are 100.105.110.115 and 200.220.240.250 respectively. Say the computer Com-1 wants to send the message "MY ACCOUNT. NUMBER is 12376" to Com-2. For all practical purposes and security reasons they may decide the following rules for sending and receiving the messages.

Sending The Message

1. Complete message will be broken into two equal parts.
2. Contents of the messages will be reversed.
3. Total number of digits in the message will be added at the end.
4. Address of the computer, sending the message, will be added at the beginning of the message.
5. Address of the computer, to which the message is being sent, will be added at the end of the message.

Receiving The Message

1. Takeout the address from the end of the message and compare it with own address. If the addresses match, read the message else reject it.
2. Remove the addresses from the end and beginning of the message. Also remove total number of characters from the message to get the reversed message.
3. Count the number of characters in the message and compare it with the number received along with the message. If both the numbers match reverse the message to get the original message else ask the computer (whose address was attached at the beginning of the message) to sent the message again.

Following these rules Com-1 will break its message into two packets, as follows and send it to the other Com-2.

Packet-1 : 100.105.110.115 UN TNUOCCA YM13 200.220.240.250.

Packet-2 : 100.105.110.115 67321 SI REBM 13 200.220.240.250.

When Comp-2 will receive this message, it will perform all those steps, which have been agreed upon for receiving the message.

Note that this simple agreement between two computers (protocol) ensures following points:

1. Small messages are transmitted over the communications medium so that it doesn't get heavily loaded and other computers also get time to send their messages.
2. Message reaches the right destination.
3. If the message doesn't reach destination in original form, it is traceable and recovery is made by requesting the source computer to send the message again.

This example clearly illustrates that protocols are necessary in computer networks. They not only establish communication rules but they also promote efficient use of communication components. Numerous protocols are available for computer communication network. Some of them are described later in this chapter.

MODES OF COMPUTING

Basic objective of any computer network is to share the resources. To meet this objective, computers are arranged in any one of the topologies mentioned earlier. Once they are connected, they can be configured to play different roles, within the network. The way they are configured would decide the approach that they would follow for communication and resource sharing. Following are few commonly used approaches that are used for resource sharing.

1. Peer to peer model
2. Client server model.

Peer To Peer Model

In peer to per communication, any computer can access any computer's resources. For example, if there are four computers viz. A, B, C and D connected in a network then computer A can access computer B's hard disk and get the data from there. It can also access computer C's printer and print its files on it. Similarly computer B and C can access computer A's CD-ROM drives and get the required copies from there.

In this type of approach any computer can request for any resource from any computer and any computer can serve any computer of the network. Obviously a computer can access the resources of other computer, only if has been configured so and the access is allowed.

This is very simple approach for resource sharing. Theoretically it works for large number of computers (as large as 100) but practically suits well for 6 to 7 computers. Over and above this number, operational difficulties start occurring. Peer to peer communication is illustrated in figure 4.14.

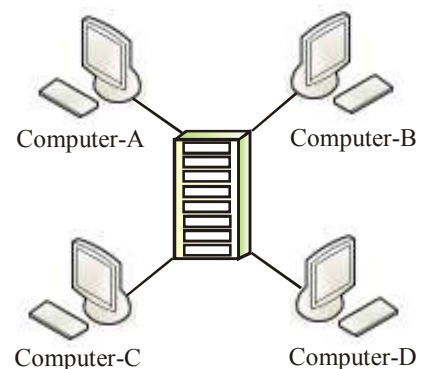


Figure 4.14

Client Server Model

In this type of approach, at least one computer is identified as Server. Server is generally a high-end computer, which is fast, has larger memory, fast disks and other peripherals that are to be shared among the users. This server holds all the resources (data, software, devices etc) that have to be shared among the users of the network (other computers).

Other computers of the network (that are not acting as server) act as clients (also called, node). Clients send their requests to the server for the resources. Server entertains their requests and supplies requested resources to clients.

Note that in this approach if S is the server then computer A, B and C do not interact with each other for resource sharing, instead, they interact with S, which has all the resources available with it.

This approach of resource sharing is quit popular now a days and is being widely used all over the world. A simple setup of client server architecture is illustrated in figure 4.15.

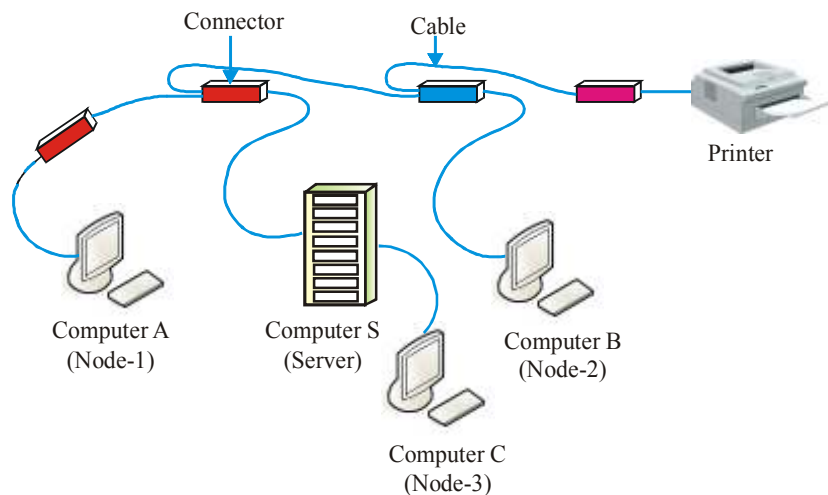


Figure 4.15

COMMON NETWORK SERVICES

You know that computer network comprises of multiple computers, which communicate with each other to make resource sharing possible among them. For managing this task efficiently and carrying it out in error free manner, various network services are available. Each service has its purpose and advantage. Few commonly used network services are described below.

Domain Name System (DNS)

Network resources are identified by four set of numbers that remain separated from each other by dots (.). Collectively these numbers are called IP address. For example, 128.105.200.010 is an IP address. This address could be assigned to a computer of the

network for identification. IP addresses are difficult for network users to remember. So network resources are also allocated a unique alphanumeric name called domain name. For example, computer having IP address 128.105.200.010 may also be allotted a domain name say grace.com, which is easy to remember. It is just like student of a college, who is identified by his roll number and name too. While working on computer network, most of the users refer computers by their domain name. Domain Name System is a network service that translates domain names into corresponding IP address. The server, on which this service operates, is called DNS server.

Simple Mail Transfer Protocol (SMTP)

Simple Mail Transfer Protocol is a service that provides facility for sending and receiving e-mails over network. When a network user sends e-mail to other user, it first stops on the server that has SMTP service operational on it.

Since SMTP service is limited in its ability to queue messages at receiving end, it is usually used with one of the two other protocols, POP3 or IMAP that let the user save messages in a server mailbox and download them periodically from the server. In other words, it can be said that user of the network uses a program that makes use of SMTP service for sending e-mail and either POP3 or IMAP for receiving e-mail.

Telnet

Telnet is a network service, using which other computers of the network can be accessed. For example, computer A, B, C and D may be networked together and you may be working on computer A. Using telnet you can access computer B. When you execute commands on computer A, they get executed on computer B. To start a telnet session on your computer, you should have a valid login name and password for the computer, which you wish to access.

FILE TRANSFER PROTOCOL (FTP)

FTP is acronym for File Transfer Protocol. It is a service, using which files are transferred from one computer to another computer of the network

FTP comprises of two main computers i.e. FTP client and FTP server. FTP server monitors the network to find out if there is any request from a computer to establish a session. FTP client sends a request to server to establish a connection. Once the connection is established, client can perform following activities:

- (i) Uploading the file to the server
- (ii) Down loading the file from the server
- (iii) Renaming the file on the server
- (iv) Deleting the file on the server
- (v) Move the file from the server

Rlogin

rlogin is a network service very similar to telnet. It is basically a UNIX command that allows an authorized user to login to another UNIX machine, present in the network. Once you login to other computer, you can perform all those activities, for which permissions have been granted to you.

Rsh

rsh is other network service, which allows to run a single command on some other machine of the network. For example, computer A, B, C, D may form a network. In this network, using rsh service, a command may be given on computer A to copy a file from computer B to computer C. Note that while making use of rsh service, you do not login into remote computer but perform the task on it

X Window System

X Window system is a major network service, which provides standard toolkit and protocols for building graphical user interface on UNIX, UNIX like operating systems and open VMS.

RPC Based Service

RPC is acronym for Remote Procedure Call. It is a network service that allows a program on one computer to execute on another computer (server). The client program sends a message to the server with all required arguments and server returns a message containing the result of the program, which is executed. Using PRC service powerful distributed client/server programs can be developed.

Network File System (NFS)

Network File System is a network service, which works for client server system. It lets a computer user view and optionally store and update files on remote computer, as if they were on user's own computer.

For example, if you were using a computer linked to second computer via NFS, you could access files on second computer, as if they resided in a directory on first computer. This is accomplished through the process of exporting and mounting. It was designed and developed by Sun Microsystems. To make use of it in network set up, server should have NFS server installed on it and client computer should have NFS client installed on it.

Web Service

World Wide Web Consortium defines Web Service as software system designed to support interoperable machine-to-machine interaction over network. It makes use of Hyper Text Transfer Protocol (HTTP) to make multimedia applications come alive over network. Details of HTTP are described later in this chapter.

Finger

Finger is a network service that tells you the name and other information related to given e-mail account. It also tells you if he is currently logged on to network or not.

To finger another network user, you need to have the finger program on your computer. The server at the other end must be setup to handle finger requests. A "Plan" file should be created for the user that can be fingered. Most of the colleges, universities and large corporations, who have their own computer network, install finger service in their network setup.

PING

Ping is network service that sends series of data packets to a specific computer over network, in order to generate a response from that computer. The other computer responds with acknowledgement that it has received the packets.

Ping service was created to confirm if the given computer (with given IP address) exists and is connected to network.

SAMBA

You know that network is a collection of interconnected computers. It is not necessary that all the computers should be of same type and should make use of same operating system. Truly speaking, network environment could be totally heterogeneous in terms of hardware and software both. But at the same time, it is preferred that while working on network all factors should be taken care by the network services, internally and user should be provided heterogeneous working environment, while shifting his work from one computer to another. For example, Windows user should be able to print his file on UNIX server, in the same way as he does on Windows system.

Samba is a network service that works between UNIX and Windows computer to provide same working environment to Windows users on UNIX server. Samba runs on UNIX platform, but speaks to Windows clients like a native. It allows a UNIX system to move into a Windows "Network Neighborhood" without causing a stir. Thus Windows user can comfortably access file and print services, without knowing or caring that those services are being offered by a UNIX host.

COORDINATING DATA COMMUNICATION (OSI MODEL)

Computer network doesn't mean that all the computers will be of same type, they will use same operating system and communicate for same application. The truth is that a computer network may comprise of heterogeneous hardware, different operating systems and diversified applications. Such a situation demands that multi layered protocol should be defined to take care of the issues like, how the computers should be physically connected, how should data be transported from one computer to another, how two different applications should exchange data among them etc. To resolve this issue, International Organization for Standards (ISO) defined a seven layers model, called Open System Interconnection reference model or OSI model in short.

Each layer of OSI model is basically a specific issue. Related to each issue, it defines certain rules and thus sets parameter for network connectivity. OSI reference model is illustrated in figure 4.16.

Refer figure 4.16 and note that OSI reference model is a seven-layer mode. Each layer uses the functions of the layer below and exports the functionality to the layer, above. A brief introduction of each layer is given below.

Physical Layer

First layer of OSI model is called physical layer. It defines all the electrical and physical specifications for the devices that are part of computer network. This includes pin specifications, voltage details, cable specifications etc. Specifications related to hubs, repeaters, network adapters etc are also specified in physical layer.

Data Link Layer

Second layer of OSI reference model is called data link layer. This layer deals with the issues related to data transfers. It takes care of speed mismatches that may occur while data gets transmitted in the physical layer. It detects and possibly corrects errors that may occur in the physical layer.

Network Layer

Third layer of OSI reference model is called network layer. It mainly deals with routing functions and congestion control.

To understand the concepts consider figure 4.17 that shows that there are various paths, which a message can follow, if it has to travel from A to D. It can either follow A->D or A->B->D or A->C->D path. Network layer decides, in which circumstance, which path should be followed. It takes care that no path should be heavily loaded.

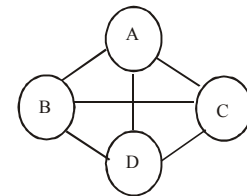


Figure 4.17

Transport Layer

Fourth layer of OSI model is called transport layer. It mainly deal with flow control of data and provides error detection and correction mechanism.

To understand the concept, consider figure 4.17. D may receive data from A, B and C together for three applications, say Ap1, Ap2 and Ap3. Transport layer keeps track of each data stream and ensures that they maintain their individuality and do not get mixed up with each other.

Session Layer

Fifth layer of OSI model is called session layer. It deals with the individual sessions that are established between the computers for communication. To understand the concept, refer

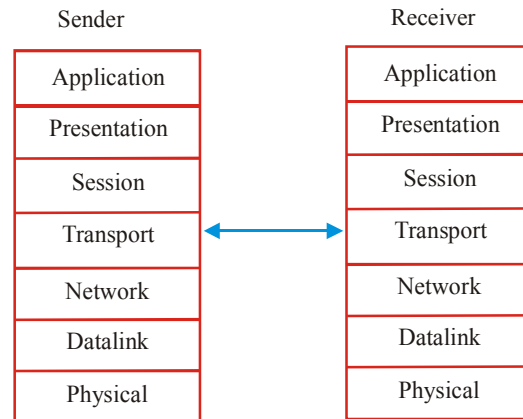


Figure 4.16

figure 4.17. Say A wants to be in dialog with D then it will open a session for communication and when communication finishes it will gracefully terminate the session. Session layer will perform these functions.

Presentation Layer

Sixth layer of OSI reference model is called presentation layer. This layer mainly deals with the presentation aspects of the data. For example, the data may have to be presented in compressed form or coded form or EBCDIC data may have to be converted into ASCII or vice versa. All such type of data presentation activities are performed by presentation layer.

Applications Layer

Seventh layer of OSI reference model is called applications layer. It mainly deals with making the information available to the user. For example, files residing on CUI based system (say a computer with Unix operating system) have to be viewed on GUI system, which is networked with it. It is quite obvious that these files have to appear as icons here on GUI based system. Now the question is, how this becomes possible? Well, application layer takes care of such issues. Telnet, FTP (File Transfer Protocol), Simple Mail Transfer Protocol (SMTP) etc. are few protocols that are related to applications layer.

DATA TRANSMISSION

If we talk about ancient times, data was transmitted through pigeons or runners in the form of letters or instructions. In case of telephones, the voice is transmitted over telephone wires in the form of electronic signals. In case of TV transmission, programmers are transmitted through air in the form of very high frequency signals.

In case of computer network, data is transmitted through medium (that connects the computers of the network) in the form of signal.

In short, it can be said that in any kind of data transmission, now, data is transmitted in the form of signals (i.e. waves). Since signals could be of many types hence data transmission is also of many types. Different forms of data transmission are described below.

Forms Of Data Transmission

Form of data transmission is directly governed by the type of signal that is used for transmitting the data. Data transmission has been classified into following two categories:

1. Analog transmission
2. Digital transmission

Details of both types of transmission are described below.

Analog Transmission

To understand the concept of analog transmission, let's first understand the nature of analog signal.

An analog signal is a continuous signal, whose amplitude, phase, or some other property

varies with time. Voice signals, TV signals, electric signals, light signals etc. are the examples of analog signals. There are basically three characteristics, which define the analog signal/data. They are amplitude, frequency and phase. An analog signal in terms of continuously changing voltage is shown in figure 4.18.

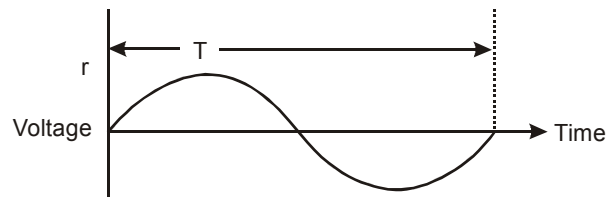


Figure 4.18

Amplitude

Amplitude of a signal at any given point of time is defined as the value of the signal at that time. Note that amplitude of the signal is varying with time in figure 4.18.

Frequency

Frequency of the signal is measured as amount of time required by the signal to complete one cycle. Refer figure 4.18 and note that time period T shown in it defines its frequency.

Phase

Phase is basically a relative concept. Thus, if you have two signals, phase difference between them at any point of time will be the cycle difference between them. Phase difference is measured in degrees. For example, if the phase difference between the two signals is 180 degrees that means, when one will have positive peak, other will attain negative peak.

Data transmission, in which data is transmitted over the medium, in the form of analog signal, is called analog transmission.

For example, in telephone communication system, voice travels over telephone wires in the form of analog signals.

Digital Transmission

To understand the concept of digital transmission, let's first understand the nature of digital signal.

Digital signal is basically string of electronic pulses. It comprises of only two values, generally referred to as high and low. In computer, entire data is represented in the form of digital signals. High signal value denotes 1 and low value denotes 0. A digital signal is shown in figure 4.19

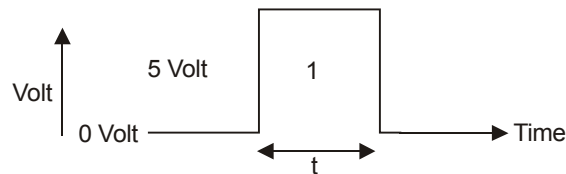


Figure 4.19

Using these pulses we can represent the number, 11001 as shown in figure 4.20.

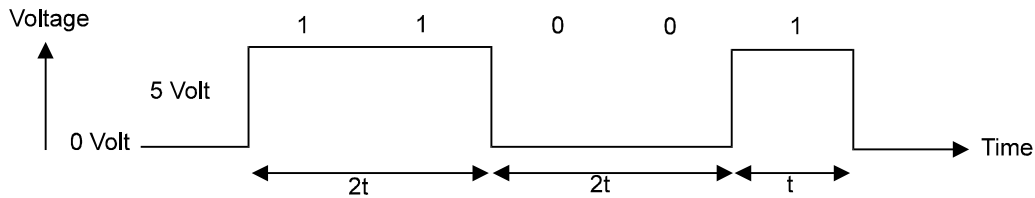


Figure 4.20

Data transmission, in which data is transmitted over the medium, in the form of digital signal, is called digital transmission.

For example, in a local area network, in which two computers are placed side by side, digital transmission takes place. Many modern TV channels transmit their TV programs in digital form.

DAMPING

When signals are transmitted over transmission line, they start getting weak and their shape starts getting deformed as shown in figure 4.21.

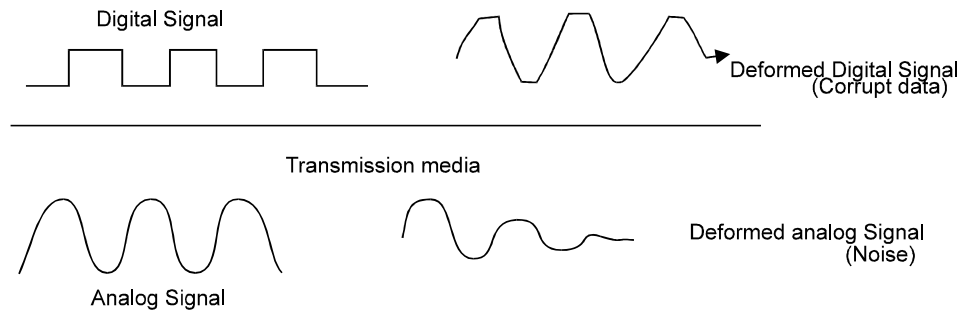


Figure 4.21

This process of signals getting deformed is called damping. Note that a damped signal that reaches the destination will result into corrupt data (digital signal) /noise (analog signal).

At what distance the damping will start, will depend upon the power of the signal. Since digital signals are low powered signals hence they get damped much earlier than analog signals do. But it is a fact that both types of signals start dying after certain distance. So if a proper communication has to take place between the computers of the network then damping has to be stopped and the signal should reach the destination in its original form. There are many devices, which perform this task. Modem is one of them. Details of modem are described below.

Modem

Modem is a device that enables computer to transmit data over telephone or cable lines.

Note that computer internally stores the data in digital form, whereas data over telephone lines is transmitted in the form of analog signals. A modem at sender's end converts digital form into analog form and the modem at receiver's end performs opposite function i.e. converts analog form into digital form. The functioning of modem is illustrated in figure 4.22.

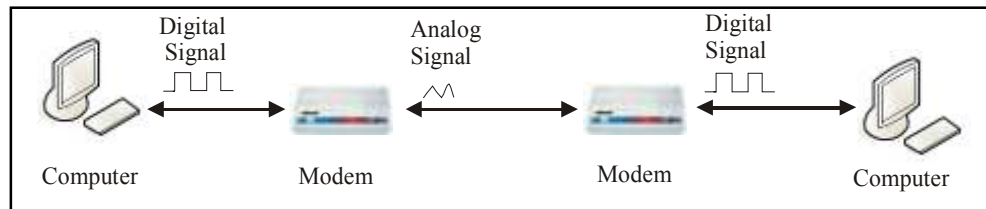


Figure 4.22

DATA TRANSFORMATION

Data world within the computer comprises of digital signals. Computer receives, stores and generates data in digital form. In external world data exists in analog form. Thus for the interaction of two worlds, data need to be converted from one form to another i.e. from analog form to digital form and from digital form to analog form. These processes are done using following devices:

1. **Analog to digital converters:** As the name indicates, these devices convert analog signals into equivalent digital signals.
2. **Digital to analog converters:** These devices convert digital signals into equivalent analog signals.

Analog To Digital Conversion

Analog to digital conversion is a process, in which analog signal is converted to digital signal.

As mentioned earlier and shown in figure 4.18, analog signals acquire continuous values over a period of time. For example, a sine wave signal of T frequency that varies from $-5V$ to $+5V$ will acquire all possible values such as -4.7 , -4.5 , -4.2 , -3.6 , 0 , 1.6 , 2.5 , 3.8 , 4.9 etc. starting from -5 to $+5$ within $1/T$ time interval.

As shown in figure 4.19, digital signals acquire only discrete values. For example, a digital signal of T frequency that varies from 0 to $+5V$ may attain only two values i.e. $+5$, and 0 within $1/T$ time interval.

Now the question is how, in the process of analog to digital conversion, so many values of analog signal are converted to discrete values, so as to have equivalent digital signal for given analog signal? Well, this is done in following steps:

1. First we decide all possible digital values that will be available for representing different values of analog signal.
2. Analog signal is sampled at regular intervals and its amplitude value is observed.

3. The value obtained at any time for analog signal is matched with the nearest digital value available and stored in digital form.

Details of these activities are explained below.

Deciding All Possible Values Of Digital System

Number of possible values that would be used in digital system, depend upon the number of bits that would be used for representing the corresponding values of analog signal. For example, if you use 1 bit system then only 2 values i.e. 0 and 1 will be available for representation. If you use 2 bit system then 2^2 i.e. 4 values will be represented by it. These values will obviously be 00, 01, 10 and 11. On the other hand, 8 bit system will represent 2^8 i.e. 256 values and 16 bit system will represent 2^{16} i.e. 25536 values. That means higher the number of bit, higher will be number of values represented by it. This is defined as accuracy. That means, higher bit system will be more accurate.

To understand the concept, let's take the case of 3 bit system. Say the analog signal varies from +5V to -5V. Thus all the variation starting from -5 to +5 i.e. -4.9, 3.8, 2.4, 1.2, 0, 1.9, 2.6, 3.8, 4.2 etc. will have to be represented using 2^3 i.e. 8 digital values only. That means this system will not be able to recognize any voltage variation, which is less than $10/8$ i.e. 1.2V. In other words, you can say that in three bit system 1.3V, 1.5 Volt, 1.6 Volt, 1.7 Volt etc. will all be represented by same number say 101. This is not a very good condition. Such a system is not very accurate system.

Now let's take the case of 8 bit system. This system will have 2^8 i.e. 256 discrete values to represent all variations of analog signal. For example, if the analog signal varies from -5V to +5V then minimum variation of $10/256$ i.e. 0.039V will be accounted for in this system. That means voltage like 1, 1.5, 1.6, 1.7 etc. will be represented by different digital numbers. This condition is far better than previous condition, in which 3 bits system was being used.

Sampling

In sampling, amplitude of the analog signal is observed at regular time intervals. Sampling process is shown in figure 4.23

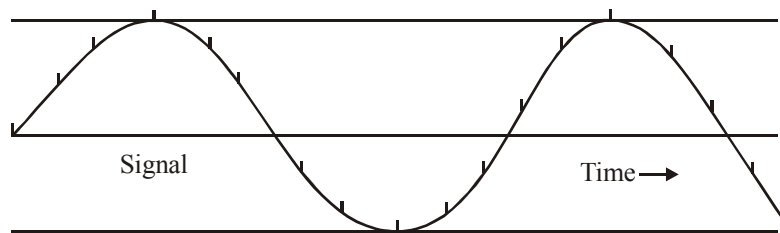


Figure 4.23(a)

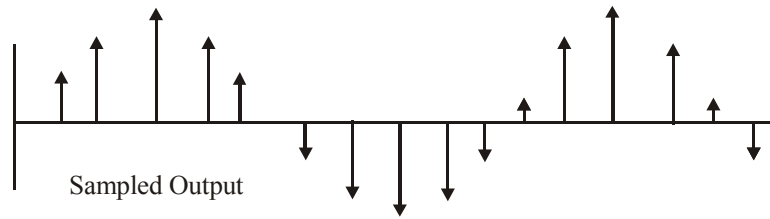


Figure 4.23(b)

From figure 4.23, it is clear that sampling period must be smaller than the time period of the analog signal.

Quantization

Now the amplitude value observed for the analog signal at any point of time through sampling process has to be converted into equivalent digital number. But digital system deals with discrete values. It is very likely that the amplitude value that is to be converted falls somewhere between the two digital values. Thus the value nearest to it will have to be chosen.

In other words it can be said that quantization is the process of determining, which of the possible values is the closest value to the current sample. Quantization thus introduces error because digital value will be nearby value not the exact value. How big the error, or how accurate the answer will be, depends upon the number of bits that are used to denote digital equivalent. More the bits, better the answer.

In quantization, complete range is divided into two equal halves. (In the diagram this division is done using solid line). If the value, we are sampling, is above this line, '1' is assigned to it. On the other hand, if it is below, '0' is assigned to it. Consider figure 4.24 and take the case of A point. Since it lies in the upper half hence '1' is assigned to it in this process.

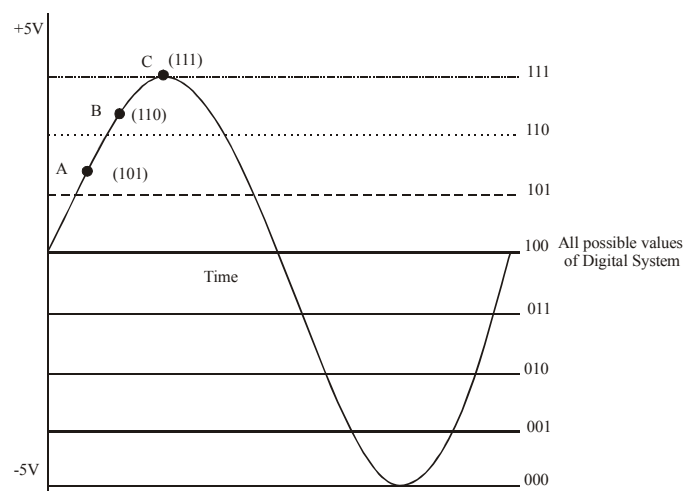


Figure 4.24

Now the half range that has the sampled value in it is again divided into two halves. In figure 4.24, this is shown by dotted line. Once again, if the value we are sampling is above this line, '1' is assigned to it. If it is below, '0' is assigned to it. Since point A lies below the dotted line hence 0 is added to the previous result. So after second round of division, we collect the result '10' for point A.

Now the half range that has the sampled value in it is again divided into two halves. (in figure 4.24, this is shown by dash line). Once again, if the value we are sampling is above this line, '1' is assigned to it. If it is below, '0' is assigned to it. Since point A lies above dash line hence '1' is added to the previous result. So after third round of division, we collect the result '101' for point A.

This process is repeated as many times as number of bits decided for the process (accuracy). For example, if we are working with 3 bit system then the process will be repeated 3 times. If we are working with 8 bit system, it is carried out 8 times.

This process is done for each sample that we take in sampling process. For example, if we take three samples A, B and C then this process will be done for all the three values. Their digital representation will yield 101, 110, 111.

In actual, for better definition and better results, what we need is to take more samples (i.e. more points like A, B and C i.e. higher sampling rate) and more divisions (i.e. use of more number of bit to represent digital values i.e. higher accuracy).

Digital values obtained from sampling and quantization process are transmitted to the required destination. Thus analog signal gets transmitted to the required place in digital form. Since data is in digital form hence it does not get mixed with noise during the transit. It reaches there in pure form. At the receiving end, analog signal is reconstructed from the digital values received through dedicated devices.

Construction Of Continuous Signal From Digital Values

D to A converters are used for obtaining analog signal back from digital values that are received. D to A converters construct the digital signal from the digital values. By extrapolation of the values they regenerate the analog signal. This is shown in the figure 4.25

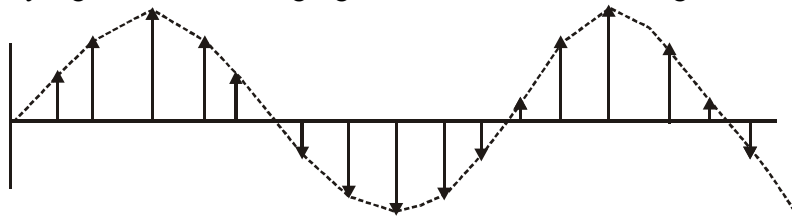


Figure 4.25

TRANSMISSION TECHNIQUES

Recall that in computers all the characters and number are represented in terms of 0s and 1s called bits. These bits are physically identified as low voltage (0 volt) and high voltage (5 volt) respectively.

While transferring the data from one computer to another, it is the stream of bits that get transferred. Say you want to transfer the number 589.

These three characters can be transferred under two conditions.

1. The time gap between transferring 5 and 8 is different than the time gap between transferring 8 and 9 (This happens due to various reasons). In this case when there is a time gap then voltage transmitted would be say one. So if it remains 1 for three cycles then the receiving computer will not understand that the line is idle or these three 1s are part of data.
2. The time interval between the transmission of two characters can be made constant.

Asynchronous Transmission

Asynchronous transmission is a technique, which addresses to the first type of problem. In asynchronous transmission a start bit is added before every character and a stop bit is added at the end of every character. This is done by maintaining the transmission line in state of 1 and using 0 as the start bit. The stop bits are 1, to distinguish them from start bits.

Data bits are then transmitted at uniformly spaced time intervals between the start and stop bits. A timer at the receiving end starts with the characteristic pattern of asynchronous transmission. This is illustrated in figure 4.26.

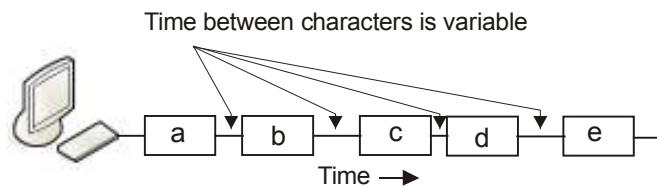


Figure 4.26

Synchronous Transmission

In synchronous transmission the sending device has a clock and the receiving end also has a clock. Before sending the data both the clocks are synchronized and the time interval between the transmissions of two characters is maintained same.

Note that in synchronous transmission the speed of data transmission is increased because of the fact that the non-information carrying start and stop bits are removed in this method. Once the two clocks are synchronized they continue to be synchronized because in between they send their own signals and keep synchronizing themselves. A characteristic pattern of synchronous transmission is illustrated in figure 4.27.

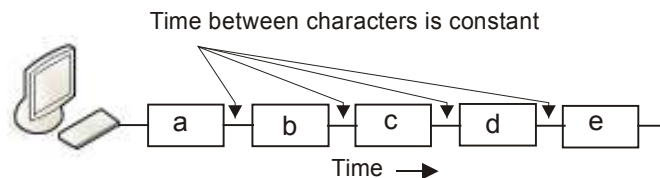


Figure 4.27

MODES OF TRANSMISSION

Modes of transmission are concerned with the manner, in which the message travels along

the transmission line. Basically there are three modes of transmission for communication purpose. They are as follows:

- (a) Simplex
- (b) Half duplex
- (c) Full duplex.

Simplex Mode

In this mode, the data is transmitted in one direction only. In no way, the sender can receive the information from the receiver and in no way the receiver can send the information to the sender that the message was received correctly. Radio and television broadcasting are the best examples of Simplex mode.

Half Duplex Mode

In half duplex mode, data is transmitted in both the directions but not simultaneously. While the sender is transmitting, receiver cannot transmit his message. He will have to wait till the time sender stops sending his data. Wireless sets that are used in army are the best examples of it.

Full Duplex Mode

In full duplex mode, line can send and receive data in both the directions simultaneously. Neither the sender nor the receiver has to wait for the other person to finish his transmission. Telephone lines are the best examples of full duplex mode.

PARALLEL TRANSMISSION

In parallel transmission, there are multiple lines (usually 8 or multiples of eight) so that more than one bit can be transmitted at a time. Since multiple bits are transferred in parallel hence the transmission is very fast. But in spite of being fast, it is not practically used for longer distance because multiple lines are costlier to lie and due to the parallel wires running beside each other, the problem of cross talk starts and the signal gets corrupted. But for the shorter distances such as connecting printer to the computer for printing, it works very well.

SERIAL TRANSMISSION

In serial transmission there is only a single line (or few more) between the source and destination and the complete data is transferred through it. Since the data bits are transferred one by one, in series, hence serial transmission is quite slow in comparison to parallel transmission but in spite of its slow speed it is quite practical. This is the reason why it is used in abundance. For example, transmission between computer and terminal takes place in serial form. All USB devices such as pen drive, web camera etc are serial devices.

INTERNET

When many computer networks of the world were connected together, with the objective of communicating with each other, Internet was formed. In other words you can say that Internet is network of computer networks, which spreads all across the globe.

Initially the size of Internet was small. It was limited to few geographical locations only. But soon, people become aware of its utility and advantages and within short span of time, numerous computers and networks got themselves connected to Internet. Its size increased multi fold within few years of its birth. Today Internet comprises of many million computers. There is hardly any country of the world and important city of the country, where Internet is not there. A conceptual diagram of Internet is illustrated in 4.28.

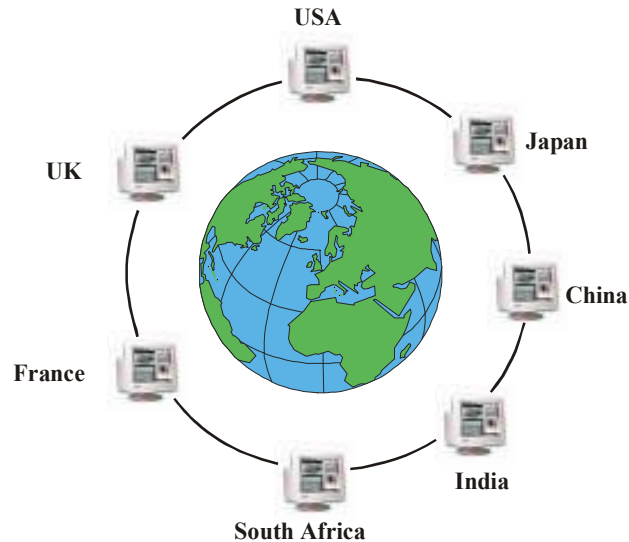


Figure 4.28

Internet is basically a large computer network, which extends all across the globe. In Internet, millions of computers remain connected together through well-laid communication system. Recall that telephone communication system is well-defined, time proven system. Internet makes use of this system any may other systems to connect its computers. Thus like a telephone connection, any computer of any city can establish a connection with any other computer of any other city and exchange data or messages with it.

CLASSIFICATION OF INTERNET COMPUTERS

Computers of Internet can be broadly classified into two categories. These categories are:

1. Servers
2. Clients

Role and requirements of both types of computers are explained below.

Servers

Those computers of Internet, which provide information or services to other computers, are called servers. For example, if a computer in an organization, named Hotmail provides electronic mail services to Internet users then that computer will be categorized as server.

Servers provide services / data to millions of Internet users, so they generally possess following characteristics:

1. They are fast.

2. They are equipped with large memory and large disk space.
3. They remain connected to Internet all throughout the day, seven days a week, 31 days a month and 365 days a year.
4. They make use of fast communication line.

Clients

Those computers of Internet, which take information or services from servers, are called clients. For example, if you make use of Hotmail's server to send electronic mail to your friends or relatives then your computer will be termed as client.

Since clients interact, with servers, on one-to-one basis and that too when service/information is required hence they possess following characteristics:

1. They need not be very fast computers.
2. They need not have large memory and disk space as servers have.
3. They get connected to Internet, when they need the information/service. After taking it, they disconnect from Internet.
4. They generally make use of slow connection, like telephone lines, to get connected to Internet.

IDENTIFICATION OF COMPUTERS ON INTERNET

Like houses of any city are identified by a unique address, similarly computers of Internet are identified by a unique address, called IP address. IP address comprises of four numbers separated by dots (.). For example, 150, 075,100.085 is a valid IP address. Each number in IP address can range from 0 to 255. So IP address can range from 0.0.0.0 to 255.255.255.255. Thus if IP address of a computer is known, it can be accessed over Internet.

HISTORY OF INTERNET

In 1960 America suspected a nuclear attack from Russia. Thus America wanted to find a way to prevent its communication network from being destroyed in the war. So an agency of American Defense Department, called Advanced Research Project Agency (ARPA) funded a project, which connected the university computer scientists and engineers together via. their computers and telephone lines. The main objective of doing so was to facilitate exchange of information. Afterwards this project became popular with the name of ARPANET. Soon the users of ARPANET started sending e-mail to each other. With the help of e-mail it became possible to send messages from one computer to another computer (which may be located at any part of the world) within few seconds. The second fold advantage of this project resulted in the evolution of mailing list, with the help of which, it was possible to send the same message to different persons (located anywhere) at the same time. This project thus marked the development of Internet.

By the end of 1980, approximately 15,000 computers were connected to Internet. While in 1990, this figure went up to 3,00,000. But today the numbers of Internet connections are not easy to count.

Till 1992 all the services provided by Internet were text based. Thus in order to avail any of the facility, the user had to enter text commands. But soon in 1992 the invention of Graphical User Interface (GUI) made it possible to include graphics and other multimedia objects also with the text in the Internet. After a few years the Graphical User Interface became popular with the name of World Wide Web (WWW).

UNDERSTANDING WORLD WIDE WEB

Internet and World Wide Web are often mistakenly used as synonyms, but the fact is that their existence is very closely associated with each other, but they are different. To understand the concept of world wide web, consider two objects, Say a piece of text "Keyboard is the main input unit of computer" and the figure of the keyboard. There exists a mechanism by which both these objects could be linked together, in such a way that whenever required, one can be accessed through other irrespective of their geographical location. For example, text and graphics could either be on same computer or on different computers (one in India and other in USA) connected over Internet/network.

This mechanism of linking does not restrict itself to text and graphics linking. Other objects like sound, animation, video etc. may participate in linking. Linking mechanism also doesn't put any restriction on the length of the chain. First can be linked to second objects. Second object could be linked to third object and so on. The growing chain can involve other computers of Internet/network.

Note that volumes and volumes of such linked objects exist over Internet. All such linked articles put together are called World Wide Web.

In other words World Wide Web can be defined as part of Internet that support specially formatted documents. Documents are formatted, using a special language, called Hyper Text Markup Language or HTML in short. Documents may consist of objects like text, graphics, audio, video, animation etc. that may or may not be linked to other objects of similar type.

WEB SEVER AND WEB CLIENTS

Those servers of Internet, which host linked documents for making them available to other computers of Internet are called Web servers. Those computers, which access web servers to acquire information from web servers, are called web clients.

WEB SITE

Web site is basically, well-identified location on web server, which holds the information of either an individual or an organization or place etc. Each web site of Internet is identified by a unique name, called domain name. For example, hotmail.com, yahoo.com, indianrail.gov.in, sanchar.net etc. are valid web sites.

Domain name comprises of two or more strings of characters separated by dots (.). First string of characters is called domain name. It identifies the name of the web site, For example, in indianrail.gov.in, indianrail identifies the name of the web site. Second string

of characters identifies the nature of the web site. For example in hotmail.com, com indicates that its is commercial web site. Standard strings that are used at second place in the domain name are as follows:

String	Type of web site
com	Commercial organizations (profit making)
edu	Educational institutes
gov	Government organization
mil	Military
net	Network service providers
org	Non profit making organizations

Third string in the domain name is always indicative of country. For example, "in" is used for India. "au" is used for Australia, "uk" is used for United Kingdom, "fr" is used for "France" etc.

If domain name of a web site is known, it can always be accessed and its contents can be viewed.

WEB PAGE

Information or services on any web site are arranged in terms of web pages. A web page may contain elements like text graphics, sound, animation video and hyper links in it.

A web site may consist of interlinked multiple web pages. When you access a web site, its first page gets displayed on you computer. Since web pages of a web site remain interlinked through hyper links hence you can always access other web pages, after accessing the first web page.

HYPER LINK

When a link between two objects, is maintained in such a way that when you click the mouse on first object, second object gets displayed then such a link is called hyper link. Concept of hyper link is illustrated in figure 4.29.

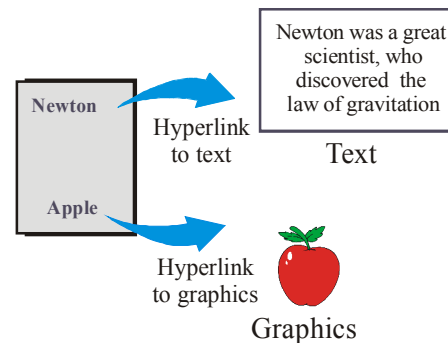


Figure 4.29

HYPERTEXT

The text that remains linked to other objects like text, graphics, audio etc. through hyper link is called hypertext. For example, the words Newton and Apple in figure 4.29 are hypertext.

HYPERMEDIA

As hypertext allows you to link the text with another text, in the similar manner, hypermedia allows the user to create a link from a particular document to either another program, or to another movie or sound clip or to Internet related facilities (like e-mail, chat etc.). When such types of links are created, they are known as Hypermedia.

COMMUNICATION PROTOCOLS

You are familiar with the word protocol and are aware of its significance in relation to computer networks. To establish a proper communication network, many protocols are used. Few commonly used protocols are described below.

TCP/IP

TCP/IP is basically an Internet Protocol suite, comprising of two basic protocols i.e. TCP and IP.

TCP is acronym of Transmission Control Protocol. This protocol is basically responsible for breaking the message into smaller packets before they are transmitted on the medium. At receiver's end, it reassembles the packets into corrects sequence to get back the message in complete and original form. The functioning of TCP protocol is illustrated in figure 4.30.

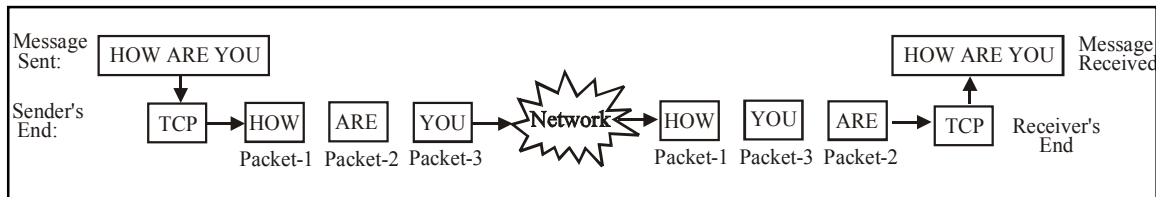


Figure 4.30

Note that transmitting shorter messages (instead of long messages) becomes easy in network. This makes the communications more efficient. Various packets can be routed through different routes (refer figure 4.17 as many routes remain available to reach the destination) at a particular time a particular line is not available.

Due to different routes undertaken, packets may not arrive the destination in sequence. Thus proper sequencing and assembling of the packet is done, as shown in figure 4.30. This activity is performed by TCP protocol.

IP is acronym of Internet Protocol. It mainly deals with addressing issues of the packets and few other aspects.

It adds addresses of the sender and receiver in all the packets. It also adds Time To Live (TTL) in each packet. As the packet travels over network this time decrements. Packet is discarded when it becomes zero. It prevents packets from wandering in the network forever and making congestion in network. The functioning of IP is illustrated in figure 4.31.

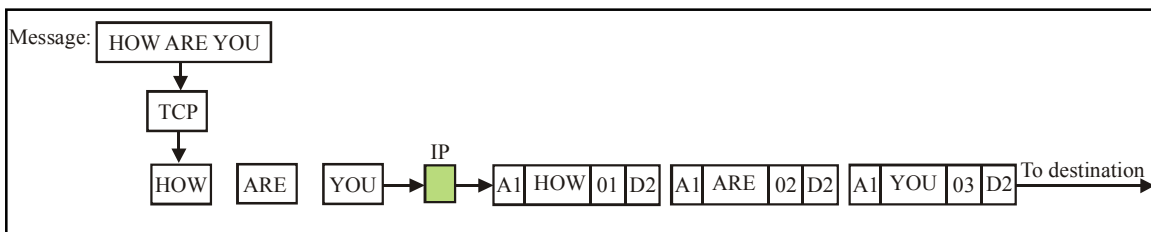


Figure 4.31

IPX/SPX Protocol

IPX/SPX is short form of Inter network Packet Exchange/Sequential Packet Exchange. It is a network protocol, which was developed by Novell Corporation for its Novell Netware operating system but now it is being used freely for other environments also.

It is basically transport layer protocol. The SPX layer sits on top of IPX layer and provides connection-oriented service between two computers of the network. SPX is mainly used in client server applications. SPX/IPX protocol is similar to TCP/IP protocol. SPX performs all those functions, which TCP performs and IPX perform all these functions, which IP performs.

Net BIOS/NetBEUI

NetBIOS Extended User Interface, is an unrouted network protocol. Routing is basically selecting a path from many paths that remain available for communication. Unrouting means, where no multiple choices of path are available. Since it is unrouted protocol hence it can only be used for communicating with the devices on same network segment.

It is transport layer protocol. It was developed by Sytek company for IBM. It provides following three main service:

1. Name service for name registration and resolution.
2. Session service for connection oriented communication.
3. Datagram distribution service for connectionless communication.

Hyper Text Transfer Protocol (HTTP)

Hyper Text Transfer Protocol is an Internet protocol, using which communication between web client and web server takes place. Dynamics of this protocol proceeds as follows:

1. When web client requires any information/service from web server, it makes a request to the web server in the form of a web page.
2. Request-web-page travels over Internet and reaches the web server.
3. Web server generates a web page containing requested information/service in it and sends it to web client.
4. Service web page travels over Internet and reaches the client.

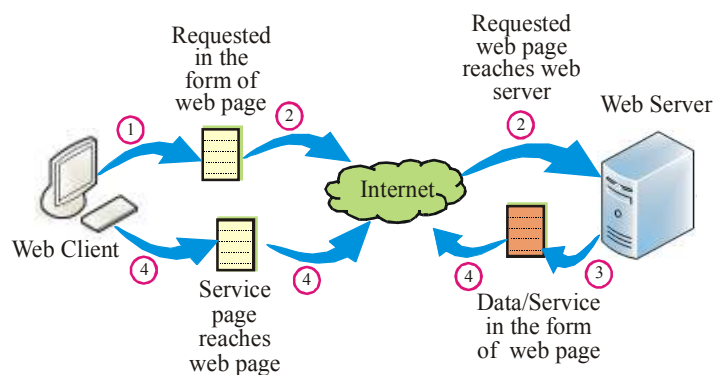


Figure 4.32

Concept of HTTP is illustrated in figure 4.32.

INTERNET USES

Internet results into instant data communication and on-line resource sharing. Due to these two factors, geographical boundaries have crushed, distance have lost their meanings, communication barriers have broken and such applications and services, which were not at all possible few years back, have now come into existence.

Today Internet is not only being used for business purposes, but for personal use also. It has brought a revolution in the society. Due to its easy availability and affordability, working and thinking patterns of human being are continuously changing and new methodologies are evolving. Below given are few important uses of Internet.

Centralization Of Information

Internet is commonly used for storing the data / information, centrally and making it available for others. Centralization of information doesn't sound so great but applications developed around this concept are really great.

1. **Reservation System:** It is a useful application that serves masses. Reservation in airplanes, trains, hotels, cinema halls etc. can be done sitting at home, using Internet. This is possible because information related to the item to be reserved remains centrally available on servers and clients can access it through Internet.
2. **Enquiry System:** Service organizations make all important information, notices and forms centrally available on server. Clients access these servers using Internet and obtain required information. For example, financial institutions may store rates of shares, bonus announcements, coming issues etc. on the server and clients may obtain required information from there.
3. **Corporate Business System:** These days companies, organizations, institutions etc. have their own computer networks connected to Internet. Company's information is maintained at a central place say, head office. Their regional offices, business clients, vendors etc. access them for their uses through Internet. For example, an organization may allow its suppliers to access company's purchase requirements and submit on-line quotations.
4. **Education Service System:** Making admission forms, examination notices, results of examination etc, available to the masses are the common applications, which educational institutions make possible through Internet. For this, they make the information centrally available on some server of Internet. Virtual universities have now come into existence, in which services related to registration, teaching, problem handling, examination etc. are provided to the students over Internet.

Fast Communication

Instant data transfer over Internet leads to fast communication among network users. It also ensures data delivery. Transfer losses are never there. Following are few commonly used communication applications, which are quite popular in Internet environment:

1. **Video Conferencing :** Video conferencing is an application, in which not only

- voice communication takes place among network users but they also exchange their live movements through web camera.
- 2. Voice Chat** : There are many network applications, using which network users talk to each other on Internet, like they do on normal phone. For this, they make use of microphone (speaking) and speakers (listening) connected to their computer.
- 3. Text Chat** : Using text chat application, network users exchange their thoughts and feelings by typing the text on their computers. What one user types on his computer, appears on other user's computer and what other user types on his computer appears on first person's computer.
- 4. e-mail** : e-mail is the most commonly used network application. Using this application users exchange letters over Internet. Letters sent through e-mail reach their destination instantly and do not get lost in the transit.

Efficient Services

Organizations and institutions make use of computer networks for providing efficient services to either internal people or external persons. Following are few services, which are common over Internet:

1. On-line advice.
2. On-line help.
3. On-line enquiry.
4. FAQ (i.e. answer to frequently asked questions made available in the form of list).

FUTURE OF INTERNET

What Internet used to be few years back is not today. What it is today will not be in future. Its shape, resources and services are advancing at amazing speed. Many surveys and studies have been conducted all across the world to predict the future of Internet.

A consortium led by 206 universities working in partnership with industry and government has been formed (in 1996) to develop and deploy advanced network applications and technologies, accelerating the creation of tomorrow's Internet. It has been named Internet2.

Based on these surveys and present developments, it is expected that following things will hold true for Internet future:

1. Internet will be more deeply integrated in our physical environments and high-speed connections will proliferate.
2. Today PC dominates Internet. Majority of the computers connected to Internet are Personal Computers. It is expected that more devices like Personal Digital Assistant (PDA) will come into existence and will be part of Internet.

3. Soon, everything from your car to your refrigerator will be connected to the global network, communicating with each other wirelessly. Electrolux, best known for its vacuum cleaners, has developed the ScreenFridge, an Internet icebox that manages your pantry, among other things. It e-mails a shopping list to your local supermarket and coordinates a convenient delivery time with your schedule.
4. It is expected that there will be a great change in the field of arts and entertainment. The ability to receive real-time music and video over the Internet, or downloaded content, will radically transform business models for TV and movies as it is already doing for music. It will also continue to change the relation of the public to artists as it has through fan sites, remixes, and other Internet-based phenomena.
5. As computing devices become embedded in everything from clothes to appliance, from cars to phones etc. these networked devices will allow greater surveillance by governments and businesses.
6. Enabled by information technologies, the pace of learning in the next decade will increasingly be set by student choices. In ten years, most students will spend at least part of their “school days” in virtual classes, grouped online with others who share their interests, mastery, and skills.

POPULAR USE OF WEB

World Wide Web is an ocean of information and service. Using web browser, you can make use of web in numerous ways. Few popular used of web are described below.

Web Browsing

Moving from one web site to another web site is called web surfing or web browsing. To access the web site, follow the following steps:

1. Get connected to Internet
2. Invoke Internet Explorer and get Internet Explorer window on the screen.
3. Enter domain name in address bar and press "Enter" key.

When you do so, Internet Explorer will search the web site and if it gets it, it will display its first page, called opening page in the browser window. For example, if you access yahoo.com web site, its opening page, as illustrated in figure 4.33, will get displayed in Internet Explorer window.



Figure 4.33

Following the Links

Refer figure 4.33 and note that web page contains few icons, a text box with button and many text-items in it. Truly speaking, each icon and each text message is a link. When you click the mouse on any of the links, linked item or service will get displayed in Internet Explorer window. For example, there is a Mail icon in the web page. When you click the mouse on it, a web page, offering e-mail service appears in Internet Explorer window. Similarly you can click the mouse on other links to avail associated services.

While traversing through links, if you wish to go to a specific web site, enter the desired domain name in address bar and press "Enter" key. If you do so, current service will get terminated and you will be taken to the opening web page of the mentioned web site. For example, if, while working with yahoo's e-mail service, you enter "hotmail.com" in the address bar and press "Enter" key, e-mail service will get terminated and opening web page of hotmail.com will get displayed in Internet Explorer window.

If you wish to retain the current page in current window and open the linked page in new window then instead of clicking the mouse on the link, right click the mouse on it. When you do so, a popup menu, as illustrated in figure 4.34, will appear on the screen.

Now select "Open in New Window" option from this menu. When you do so, linked web page will get opened in new window.

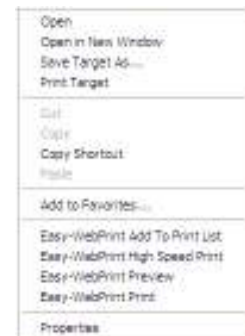


Figure 4.34

SEARCHING CONTENTS ON INTERNET

Internet is an ocean of information. Be it any topic, science, culture, entertainment, tourism, medical or aviation, volumes and volumes of information can be found on Internet. This information remains available on web sites and can be availed by visiting the web site.

Now the questions is, there are millions of web sites on Internet, so how do you come to know, which information is available on which web site and what is its domain name? Well, Internet itself provides the solution for this problem. There are certain web sites, which provide search facility for searching the contents on Internet. For example, yahoo.com is a web site, which provides search facility. Refer figure 4.33 and note that search facility remains available in the form of a text box and a button titled "Search" To get the information on any desired topic, follow the following steps:

1. Enter the search term in text box. For example, if you wish to get the information on "Examination Taking Techniques", enter this term (called, search term) in the text box and click the mouse on "Search" button.
2. When you do so, a program called Search Engine will search its information database and find the links to the information. Found links will get displayed in the form of a list, as illustrated in figure 4.35. In technical terms, this list is called "Hit List".

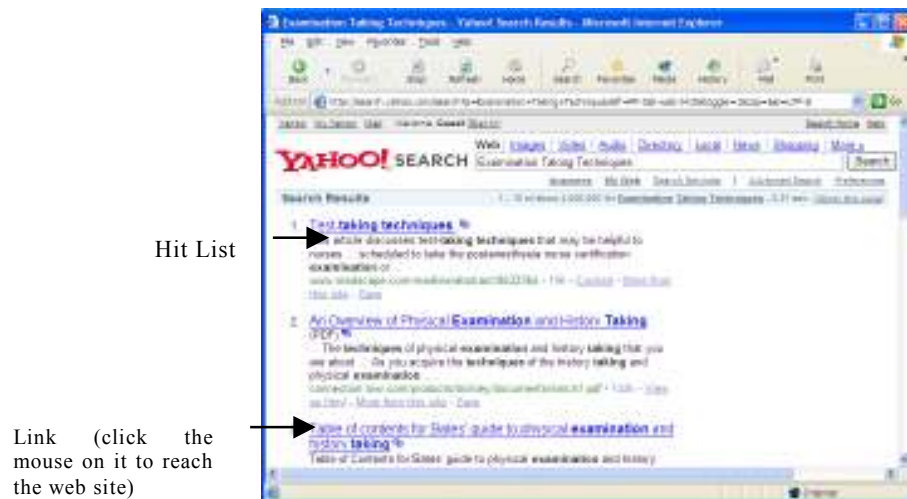


Figure 4.35

3. To reach the web site that contains the information, click the mouse on any desired link of the hit list.
4. After reaching the web site, you can make use of browser's "Back" button, to get back to the hit list.
5. Now click the mouse on another link to get more information on the same topic, but from another web site.

Important Points Related to Internet Search

Following are some of the important points that should be kept in mind, while searching the information on Internet.

1. Different search engines provide different hit lists. Thus if the results of one search engine are not satisfactory, different search engines should be tried for better results. For example, after searching the information on yahoo.com, you can move to google.com. This web site provides a different search engine. Same search term here may provide different results.
2. Search term plays an important role in the process of acquiring the information from the Internet. So search term should be framed carefully. For example, you may wish to get information on life style of Gandhi ji. For this, if you use the search term Gandhi, you may get lot of irrelevant information, which may not be of any use to you. For example, links related to Gandhi park, Gandhi restaurant, Gandhi club etc. may appear in the hit list. Thus if you use the search term, "Gandhi life style", it is likely that you may get the desired information.

Other search terms, relate to same topic should also be tried, while searching the information. For example, search term "Gandhian Philosophy" may also, fetch the desired information.

3. Two search terms can always be added, using logical operators like AND and OR to make the scope of the search more specific. For example, the search term "Flights to UK AND Flight to Franch" will yield wider results.
4. Some of the search engines produce specie results when the search term is enclosed within double quotes. For example, to search information on atom bomb you have to define the term as "atom bomb" else they will give two different types of information i.e. one on atom and another on bomb.
5. Some of the search engines, like yahoo.com provide advanced tools for defining the information that is required. If the search term is such that it does not define the information precisely then advanced tool should be used for narrowing down the scope.
6. All major web sites also provide category list. This list is usually arranged topic wise. For example, go to yahoo.com. Down, in its first page, you may have the category list, as illustrated in figure 4.36.

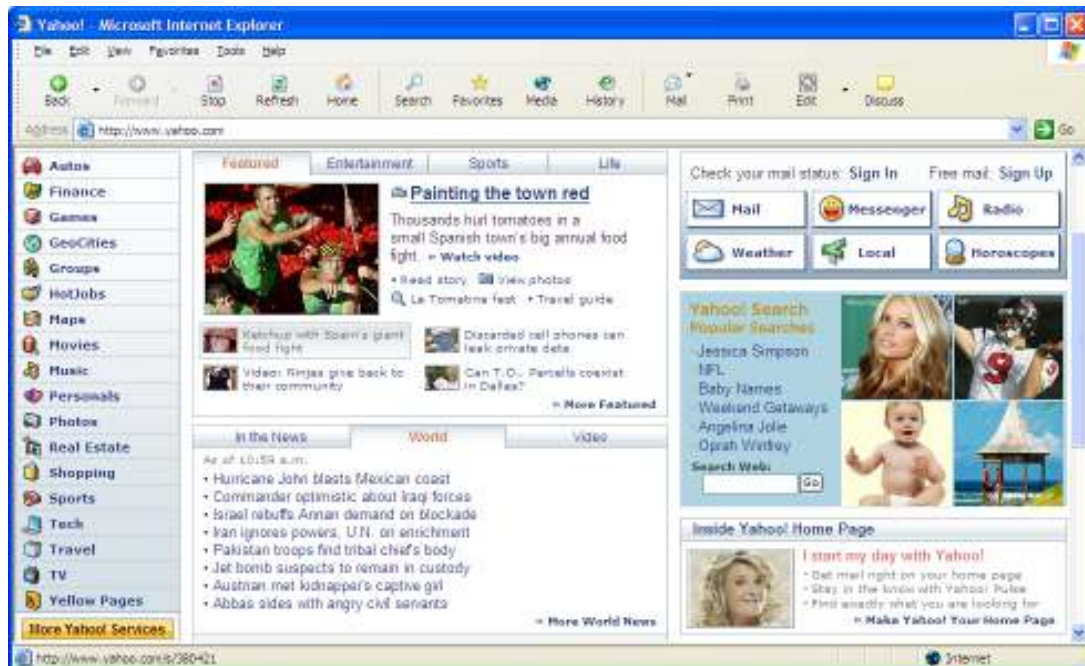


Figure 4.36

Refer above illustrated figure and note that Art & Humanities, News Media, Business & Economy, Recreation and Sports, Computer & Internet etc. are various categories that are present in the web page.

When you click on any category, your browser will display a list of subcategories. Now click a sub category heading of your choice. When you do so, you are again presented with a list of sub sub categories. You have to continue in this fashion, drilling down the complete tree, until you reach the desired page, related to the selected topic.

Chatting

Chat means talking. Chat service provides the means of on-line communication with other Internet users. Using this service, two or more Internet users talk to each other, by typing their messages on their terminal. What one-user types on his terminal, gets displayed on other user's terminal immediately. If he wishes to react against this message, he has to type his reaction on his terminal. Now, whatever he types on his terminal gets displayed on other person's terminal. Thus talking through typing can continue, till the time both the persons want.

This is the most popular and widely used service of Internet. To make it more interesting and realistic, chat service is generally provided in the form of logical rooms.

All rooms are generally related to a topic. For example, relationship, computers, friendship etc. It is possible that there may exist many rooms with in a specified topic. For example within computers there could be many rooms such as Hardware, Graphics, Multimedia, Virtual Reality, Internet etc. The basic objective of having topic-related rooms is to form a collection of people with similar interest, so that the chat may result into fruitful discussion and the number of chatters remain limited in a room. On the other hand, if the number of room were not categorized into focused variety of topics then, there would be a huge crowd of chatters in the same room. In such a room there would always be a crowd of chatters who have diversified interest. In such a situation, chatters may not find them comfortable and may start leaving the room.

Chat is very common service of Internet. It remains available on most of the web sites. For example yahoo.com, excite.com, icq.com, hotmail.com etc. are the names of few web sites which provide chat service to their visitors.

To make use of chat service, you have to first go to the web site of your choice, where you would like to chat. Now you have to open your chat account, if you have not yet opened it. When you open your chat account you have to declare your profile (name, age, country e-mail address) and choose your chat name. Chat name is the name that you would like to use during the chat. The chat name could be different from your real name because you may not like to disclose your real name to chatters because of security and personal reasons. Generally people use those type of chat names which qualify their properties or need. For example softman, helpingman, jollyboy. are the names which give an indication of the nature of the person. Similarly wanting-jokes, wanting-help, give-me-info are the names which clearly state the need of the person.

After creating your profile, you can choose any chat room of your choice. When you enter the room, you would find many persons present there. Chat names of all the persons present in the room would be displayed on the screen.

Now you can type your message or feelings on your terminal. Whatever you type on your terminal, would get displayed on the terminals of each person who is present in the room. If someone wishes to talk to you, he can type his message for you on his terminal. That message will get displayed on everybody's terminal, including your. Thus you can keep on communicating till you or the other person wants.

A chat session can be invoked through yahoo messenger. When you invoke chat session, a chat room as illustrated in figure 4.37 gets displayed.

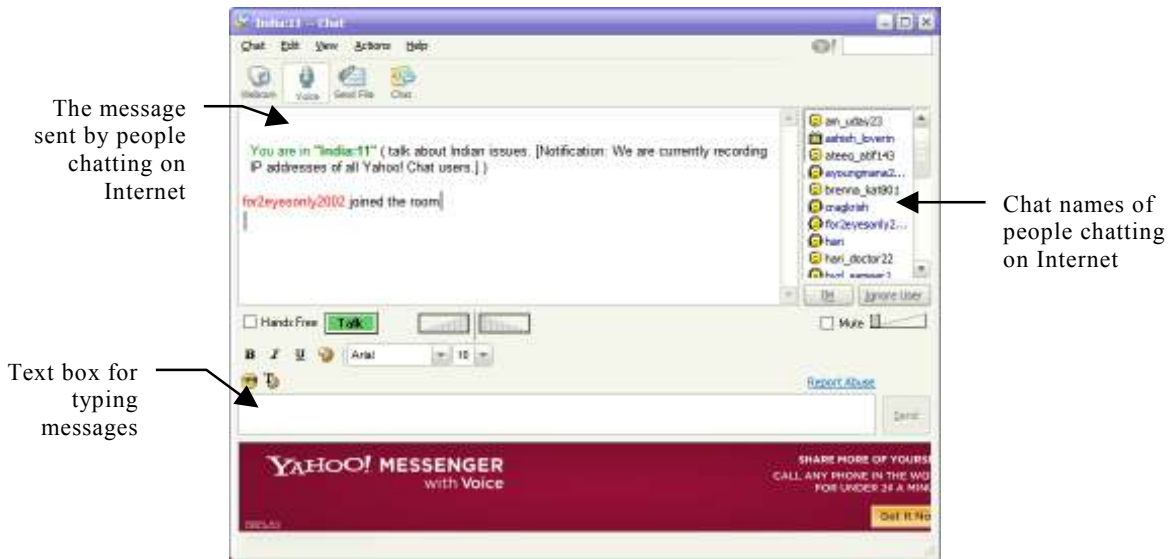


Figure 4.37

Refer above illustrated figure and note that all-important components of chat web page have been labeled, to give you an idea of chat dynamics and its operations. Using this web page you can read the message sent by other people and you can also send your own messages.

Chat also provides you the facility of sending personal messages to the desired persons. In such a case your message gets displayed only on other persons terminal, not on everybody's terminal. Thus you can do some private talks. For this, you have to simply double click on person's chat-name. When you do so then a message box appears on the screen. Whatever you type in this message box gets transmitted as private message to other chatter. A similar type of message box appears on other person's terminal also. The message sent by you (to him) gets displayed in his message box. What ever he types in his message box, gets displayed in your message box. Thus chat continues in private mode and nobody comes to know what you are talking to other person.

Some of the chat services provide you the facility to create your own private room. You can invite other chatters, in your room to talk privately. This saves you from other people's unwanted messages to appear on your screen. Thus you can have dedicated chat in isolated environment.

Internet Telephony

As the name suggests, Internet telephony is a service, using which Internet users can have voice-talk with others. It is quite obvious that to make use of Internet telephony service,

your computer should have multimedia kit attached to it. Internet telephony service can be mainly categorized into two main categories. One is Net-to-Net type of telephony. Other is Net to Phone telephony. In Net to Net type of telephony, both the persons i.e. caller and receiver have to be on-line with Internet.

When both the persons are on-line, then one of them dials other persons telephone number. Other person receives the ring and if he accepts the call then voice connection is established between them and they start talking. In Net to Phone telephony, only one person has to be on-line with Internet. This person rings other person's telephone number from his computer. Other person receives a ring on his telephone set (not computer as is done in Net to Net telephony). If this person picks up his hand set then a connection gets established between the two parties. Now, whatever, first person speaks in front of his microphone, gets transmitted to other person's hand set. Whatever other person speaks in his handset, gets transmitted to first person's speaker.

yahoo messenger, skype etc. are the services, which provide services for both types of telephony. Generally net to net telephony is free while net to phone telephony is paid service.

Internet Shopping

Internet shopping is a facility, using which items of choice can be purchased over Internet.

There are numerous website, such as yahoo.com, dell.com amazon.com, excite.com etc. which display all those items, which are for sale on the web site. In e-commerce terms these web sites or web pages are called e-shops or e-malls. In e-malls along with the picture of the product, their description, price and highlights also get displayed.

Items of interest are selected by clicking the mouse on the product image. A program called shopping basket or shopping cart remains vigilant in the background. It keeps track of all the items, selected for purchase, cost of purchase, applicable taxes and discount etc. Whenever required, it displays the status of the basket / cart. It also provides facility to add or remove items to / from it.

When all the items for purchase have been selected, Purchase Now / Submit button present on website is activated.

On activating Purchase Now / Submit button, buyer is offered an on-line form, for submitting his personal details. Using this form, he generally provides to the seller, his name, address, phone number, e-mail address, shopping address etc. so that purchased items could be sent to the purchaser on his address.

e-shopping sites also provides the facility of on-line payments. On-line payments are made through credit cards. A secured page for accepting buyer's credit card number, amount of payment etc. gets displayed where he provides all relevant information. As soon as this information is provided, given information is verified from all relevant sources. In the event of information being correct, money is transferred from user's bank account to seller's bank account and the seller sends all purchased items through post /or courier to the purchaser on his address.

Some of the items, such as games softwares memberships, access rights etc. are down loaded to purchaser's computer immediately, when he makes payment for these.

An e-shopping web site is illustrated in figure 4.38.

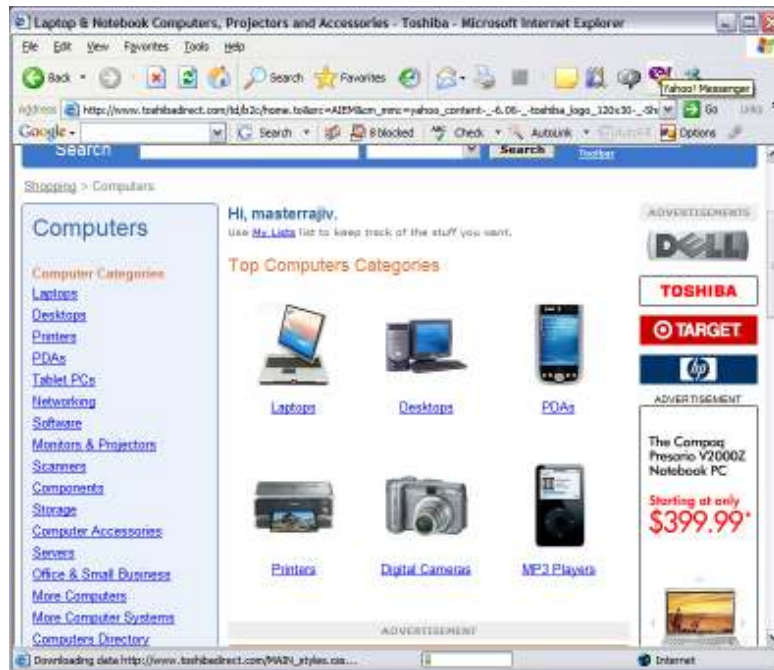


Figure 4.38

OTHER SERVICES OF WEB

Apart from above-mentioned services following services are also available on World Wide Web:

1. There are many web sites, which provide the facility to select a greetings card from many of those available on web site and send it to relative or friend.
2. Many on-line magazines and newspapers are present on web. By accessing related web site you can read them on-line.
3. News-group is a service, using which people share their views, solve their problems and help other Internet users.
3. There are many web sites, which provide astrology related services over web.
4. Movies can be viewed on web.
5. Songs and radio can be enjoyed on web.
6. Railway or air tickets can be purchased on-line over web.
7. Hotel bookings can be made on web.

8. Weather forecasts can be had from related websites.
9. On-line classes can be attended and examination can be taken on web by taking admission in virtual universities.
10. Jokes, SMS, Pager etc. can be sent to friends and relatives over Internet.
11. Games can either be downloaded or played over Internet.

SUMMARY

When two or more computers are connected together with the objective of communicating with each other and sharing their resources, they form a computer network.

Computer network is the most modern medium of communication. Using computer network, fast and reliable communication takes place. Following are the reasons for networking:

1. *To share distant devices.*
2. *To share software of other installations.*
3. *To provide a communication medium.*
4. *To evenly distribute the load of processing.*

Following are few useful applications of network:

1. *Rail/Air reservation system.*
2. *Internet banking & ATMs.*
3. *E-Mail.*
4. *Information sharing applications.*
5. *On-Line education and examinations.*
6. *Network games.*

Following are the benefits of networking:

1. *Information, available at distant locations can be accessed within no time.*
2. *Costly devices can be shared among many users.*
3. *Work can proceed even if one or few computers are down.*
4. *Much better applications can be made, which provide great help and services to its users.*
5. *Better and efficient communication takes place between the users.*
6. *On-line services can be provided, which save time and efforts.*

TYPES OF NETWORKS

Computer networks are broadly classified into two categories:

Local Area Networks (LAN): Local area networks are the networks that spread within a short distance of a kilometer or so and are generally confined to a building or a campus.

Wide Area Networks (WAN): Wide Area Networks or WAN are the networks, in which computers are spread over long distances (more than a kilometer). Computer of Wide Area Network can either be in different countries, cities or localities.

Campus Area Network (CAN), Metropolitan Area Networks(MAN) and Home Area Network (HAN) are few variations of LAN and WAN.

Topology is basically the physical arrangement of computers in the network. Following are commonly used network topologies:

Bus Topology: In bus topology, all the computers and devices of the network are connected to common medium (cable).

Ring Topology: In ring topology, computers of the network are connected to each other in circular fashion.

Star Topology: In star topology, computers of the network are connected together through a special device called hub. Each computer is connected to the hub. Thus the link of one computer is established with other computers via hub.

Mesh Topology: In mesh topology each computer of the network remains connected with other computers through dedicated medium.

Basic model of network communication comprises of following essential components:

Sender: The computer, which sends the message is called sender.

Receiver: That computer of network, which receives the message is called receiver.

Medium: Medium is basically that substance through which message propagates and reaches the destination. Medium can be wired medium or non-wired medium. Wired medium could either be twisted pair cable or coaxial cable or optic fiber cable while air works as non-wired medium.

Message: What travels from sender to receiver is called message.

Protocol: A protocol is basically a set of standards that are decided between the sender and receiver for error free communication between them.

Following are few commonly used network services:

Domain Name System (DNS): It translates domain names into IP addresses.

Simple Mail Transfer Protocol (SMTP): It provides facility for sending and receiving e-mails over Internet.

Telnet: It provides facility to login into another computer of the network.

File Transfer Protocol (FTP): It provides facility for transferring files from one computer to another over network.

Rlogin: It provides facility to login into a computer that is at remote location.

Rsh: It provides facility to execute a single command on some other computer of the network.

X Window System: It provides standard toolkit and protocols for building graphical user interface on UNIX and UNIX like operating systems.

RPC Based Service: It is a network service that allows a program on one computer to execute on another computer.

Network File System (NFS): It lets a computer user view and optionally store and update files on remote computer, as if they were on user's own computer.

Web Service: It makes use of Hyper Text Transfer Protocol (HTTP) to make multimedia applications come alive over network.

Finger: It tells you the name and other information related to given e-mail account. It also tells you, if he is currently logged on to network or not.

PING: It sends series of data packets to a specific computer over network, in order to generate a response from that computer.

SAMBA: It is a network service that works between UNIX and Windows computer to provide same working environment to Windows users on UNIX server.

Organization for Standards (ISO) has defined a seven layers model, called Open System Interconnection reference model (OSI model) for establishing proper communication between the computers of the network. These layers are:

Physical Layer: It defines all the electrical and physical specifications for the devices that are part of computer network.

Data Link Layer: It takes care of speed mismatches that may occur while data gets transmitted in the physical layer. It detects and possibly corrects errors that may occur in the physical layer.

Network Layer: It mainly deals with routing functions and congestion control.

Transport Layer: It mainly deals with flow control of data and provides error detection and correction mechanism.

Session Layer: It deals with the individual sessions that are established between the computers for communication.

Presentation Layer: This layer mainly deals with the presentation aspects of the data.

Applications Layer: It mainly deals with the mechanism of making the information available to the user.

Data transmission is conveyance of any kind of information from one place to other. Data transmission is basically of two types i.e. Analog transmission and Digital transmission. Data transmission, in which data is transmitted over the medium, in the form of analog signals, is called analog transmission.

Data transmission, in which data is transmitted over the medium, in the form of digital signals, is called digital transmission.

Two transmission techniques are there. They are asynchronous transmission technique and synchronous transmission technique.

In asynchronous transmission a start bit is added before every character and a stop bit is added at the end of every character that is transmitted. Data bits are then transmitted at uniformly spaced time intervals between the start and stop bits.

In synchronous transmission the time interval between the transmissions of two characters is maintained same.

The manner, in which the message travels along the transmission line is called mode of transmission. Following are the three modes of transmission:

Simplex mode: *In this mode, data is transmitted in one direction only.*

Half duplex mode: *In half duplex mode, data is transmitted in both the directions but not simultaneously.*

Full duplex mode: *In full duplex mode, transmission line can send and receive data in both the directions simultaneously.*

Network of computer networks is called Internet. It extends all across the globe. Computers of Internet are broadly classified into two categories:

Servers: *Those computers of Internet, which provide data and services to other computers of Internet are classified as servers. They are generally fast computers and remain connected to the Internet for all the 24 hours of the day.*

Clients: *Those computers of Internet, which take data and services from other computers of Internet, are classified as clients. They are generally slow computers in comparison to servers and get connected to Internet as and when they require services from the servers.*

Computers of Internet are identified by a unique address, called IP address. IP address comprises of four numbers separated by dots (.). For example 024.136,225,128 is a valid IP address. They are also identified by a unique name, called domain name.

That part of Internet, which makes use of Hyper Text Transfer Protocol so as to make use of multimedia media objects possible, over Internet, is called World Wide Web.

E-mail, video conferencing, chatting, Internet telephony, on-line shopping, banking, searching information on Internet, Virtual university etc. are few popular uses of Internet.

EXERCISES

CHAPTER 4

Short Type Questions

A. Select best possible options for following questions:

1. Which of the following is not an essential element of communication system?
 - (a) Sender
 - (b) Receiver
 - (c) Wire
 - (d) Message

2. What is protocol?
 - (a) A message
 - (b) Rules that have been set.
 - (c) A code
 - (d) A network device
3. Which of the following network remains confined to a building?
 - (a) LAN
 - (b) WAN
 - (c) MAN
 - (d) None of the above
4. In which type of network, computers of five different cities are connected together to form a computer network?
 - (a) LAN
 - (b) WAN
 - (c) HAN
 - (d) SAN
5. Which of the following topology makes use of a special device called hub?
 - (a) Bus
 - (b) Star
 - (c) Ring
 - (d) Mesh
6. What is TCP/IP?
 - (a) A compression techniques
 - (b) A protocol
 - (c) A type of network
 - (d) A topology
7. How many layers of protocol are there in OSI model of network?
 - (a) 7
 - (b) 6
 - (c) 5
 - (d) 10
8. Which layer of OSI model is related to physical connection of computers, within the network?
 - (a) First
 - (b) Second
 - (c) Fifth
 - (d) Seventh
9. Which of the following is related to file transfers across the network?
 - (a) FTP
 - (b) TCP/IP
 - (c) CSMA/CD
 - (d) Telnet
10. Which of the following will have fastest rate of data transmission in it?
 - (a) Twisted pair of wire
 - (b) Coaxial cable
 - (c) Optic fiber
 - (d) Starlight wires
11. Which of the following device is used to connect computer to the telephone line?
 - (a) modem
 - (b) A to D converter
 - (c) Optic fiber cable
 - (d) Web server
12. In which of the following technique, time interval between the transmissions of two bits differs?
 - (a) Asynchronous
 - (b) Synchronous
 - (c) Simplex mode
 - (d) Parallel transmission

13. In which of the following data transmission mode, transmission takes place in both the directions but not simultaneously?
 - (a) Simplex
 - (b) Half duplex
 - (c) Full Duplex
 - (d) Parallel transmission
14. In which of the following process, amplitude of the analog signal is observed at regular intervals?
 - (a) Sampling
 - (b) Quantization
 - (c) Reconstruction
 - (d) Packet switching
15. Which of the following, essentially makes use of HTTP protocol?
 - (a) Internet
 - (b) World Wide Web
 - (c) Computer Network
 - (d) None of the above

B. Fill in the blanks.

16. is a device, which is used for transmitting computer signals, over normal telephone line.
17. Those computers of Internet, which take services from other computer are called.....
18. IP address comprises ofnumbers separated by dots.
19. is a network service that mainly deals with the process of sending and receiving e-mails over network.
20. LAN is acronym of
21. WAN is acronym of
22. MAN is acronym of
23. That topology of network, in which computers are connected to each other in circular fashion, is called topology.
24. In topology, each computer of the network remains physically connected to other computers with a separate medium.
25. OSI is acronym of
26. In mode of transmission data is transmitted in one direction.
27. is the process, in which the amplitude value of analog signal is converted to digital form.
28. Out of serial and parallel transmission, transmission works faster.
29. Out of serial and parallel transmission, transmission suits well for shorter distances.
30. Is popular service of World Wide Web.

C. State true or false.

31. Network layer of OSI model deals with routing functions and network congestion.
32. TCP/IP protocol provides the facility to remote login on another computer of the network.

33. NetBIOS/NetBEUI is a network routing device.
34. IPX/SPX is a protocol for networking the computers.
35. Coaxial cables offer better data transfer rates than twisted pair of wires.
36. In coaxial cable, data is transmitted using laser light.
37. Hub is a device, using which multiple computers are connected together over single point.
38. In digital transmission, noise cannot get mixed with the signal.
39. In quantization process, analog signal is rebuild with the help of digital values.
40. In peer to per network model, one computer acts as server and other acts as client.
41. In full duplex mode, data is transmitted in both the directions simultaneously.
42. Internet can be defined as network of computer networks.
43. A to D converters are basically electronic circuits that convert digital signals into analog signals.
44. Voice signal is an example of digital signal.
45. In asynchronous mode of transmission, start and stop bits are added with each character that is transmitted.

D. Answer the followings question in short.

46. What are the two main objectives of networking?
47. Name 3 essential components of networking.
48. Name any three mediums, which are generally used for connecting the computers of the network.
49. Name any two variants of LAN.
50. Which type of signal acquires only two amplitude values?
51. Name any four topologies, in which computers of the network could be connected.
52. Draw a block diagram of Ring topology.
53. Draw a block diagram of Star topology.
54. Name any two protocols of networking.
55. Name a medium, in which data is transmitted, using light.
56. In which two modes of transmission, data is transmitted in both the directions in the medium.
57. Name the two processes associated with data transformation.
58. In which type of signal, amplitude continuously varies with time.
59. In which type of network, computers can be places as far as required?
60. Write the full form of TCP/IP.

Detailed Answer Type Questions

E. Answer the following questions in detail:

61. What is computer network? Draw a block diagram showing basic elements that are required for networking.
62. What do you understand by protocol? What is TCP/IP? Explain its role in computer network.
63. What is LAN? Explain its characteristics, giving suitable example.
64. What do you understand by the term topology? Draw a block diagram of bus topology. State advantages and disadvantages of this topology.
65. What is MAN? How it is different from WAN?
66. Draw a block diagram OSI model for networking. Explain the role of its first three layers.
67. Explain the objective of following:
(a) FTP (b) TELNET
68. Explain the role of modem in computer network.
69. What do you understand by client server mode of computing?
70. Describe at least five applications of networking. State their advantages also.
71. What do you understand by topology? How many types of topologies are commonly used? State their advantages and disadvantages.
72. What is SAMBA? What is its role in network?
73. Describe any five network services.
74. Describe the process of transformation of analog signal into digital signal?
75. Differentiate between asynchronous and synchronous transmission.

PART II

Computer Application Laboratory

**Includes theory and solution for practical
assignments**

- ❑ Windows
- ❑ MS-Word
- ❑ MS-Excel
- ❑ MS-PowerPoint
- ❑ Internet

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Computer Application Laboratory

CHAPTER 5

Windows

Windows is the most popular operating system of modern times. It has been designed and developed by Microsoft Corporation of USA. Windows not only activates computer and makes its devices functional, it also provides applications for performing wide variety of tasks on computer. For example, its Notepad program enables you to write letters and notes. Using its Paint program you can draw pictures on computer and color them too. Likewise there are many more programs in Windows. An introduction to its features, functions and applications is given in its chapter.

BOOTING COMPUTER WITH WINDOWS

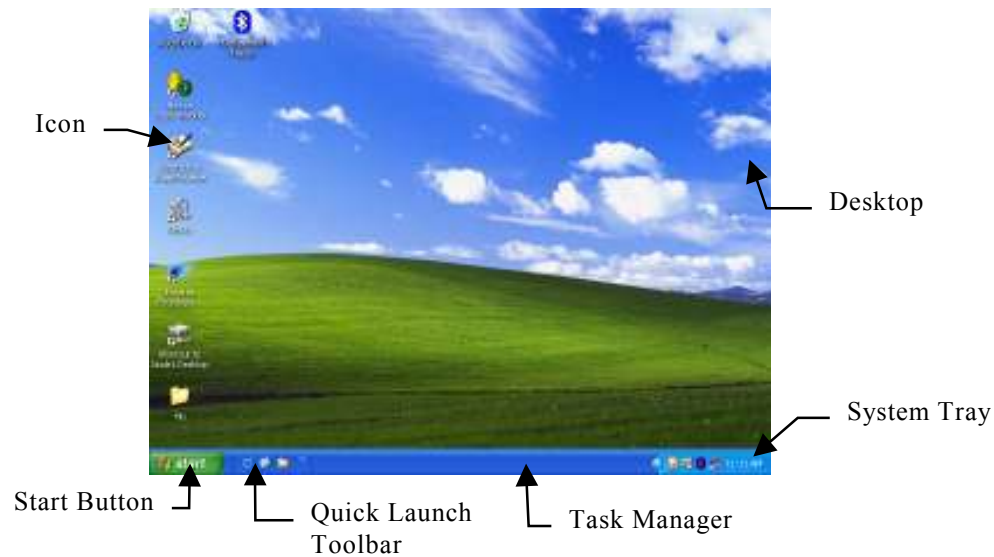
To boot the computer with Windows operating system, first switch the monitor on and then switch on the CPU, using ON/OFF switch present in its chassis.

When you do so, computer will check all its peripherals, if they are functioning properly or not. If any unit is found faulty, an error message appears on the screen and booting process stops. On the other hand, if all the units are found OK, booting process continues. Computer reads the operating system from disk, loads it into memory and displays a dialog box, as shown in figure 5.1.



Figure 5.1

This dialog box is part of Windows security system. It asks for login name and password to ensure that only authorized persons use the system. To boot the system, enter your login name and password correctly and click the mouse on "OK" button. After a while, display on the monitor will turn as shown in figure 5.2.

**Figure 5.2**

INTRODUCTION TO WINDOWS DESKTOP

After booting the system with Windows, the first screen that appears on the monitor is called Desktop. Desktop is illustrated in figure 5.2. A brief introduction of each component of Windows desktop is given below.

Desktop Icons

Icons are graphical pictures. They represent objects like programs, files, folders etc. Initially few icons appear on desktop. Later, if the need be, more icons are placed on the desktop. To activate any icon, you need to double click the mouse on it.

Start Button

Start button is the starting point of Windows menu system. When you click the mouse on "Start" button, Start menu, as shown in figure 5.3 appears on the screen. Refer Start menu, shown in figure 5.3 and note the following points:

**Figure 5.3**

1. Some of the options in Start menu have an arrow marked in front of them. This arrow indicates that when you click the mouse on the option, a submenu will appear on the screen.

2. Some of the options have few dots (...) marked in front of them. These dots indicate that when you click the mouse on the option, a dialog box will appear on the screen.
3. Those options that neither have arrow nor dots marked in front of them get directly executed when you click the mouse on them.

Quick Launch Toolbar

As illustrated in figure 5.2, Quick Launch toolbar comprises of many buttons. Each button represents a program. When you click the mouse on any button, corresponding program gets executed.

Task Manager

Initially, Task Manager appears as blank area but when you execute any program, a button for that program gets created in this area. This button identifies the program and provides means for performing different operations on the running program. For example, using the button you could terminate the program.

System Tray

Initially system tray displays few icons and system time in it. Each icon of the system tray represents a program, which is invisibly running in the background. To operate upon a background program, you can double click the mouse on its icon. For example, to set the system date and time, you can double click the mouse on system time icon.

INTRODUCTION TO WINDOW

Windows operating system drives its name from the fact that each running program, in Windows appears in the form of a window. When you execute a program, a window appears on monitor screen. For example, when you execute WordPad program of Windows, WordPad window, as shown in figure 5.4 appears on monitor screen.

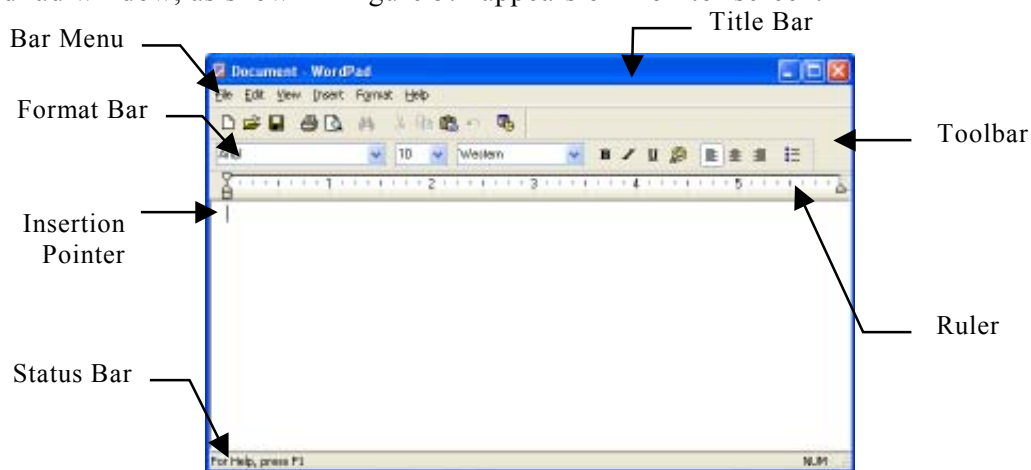


Figure 5.4

Refer figure 5.4 and note that window comprises of many components. Role and function of each component of the window is given below.

Title Bar

Title bar acts as window header. It comprises of following items:

System menu button : When you click the mouse on this button, system menu, as illustrated in figure 5.5 appears on the screen.



Figure 5.5

Program Name : Name of the program, with which window is related, appears in the title bar. This name identifies the windows. When you have many windows present on the screen, program name in title bar helps you in identifying the window.

Minimize Button : It shrinks the window to a button, placed in task bar, when you click the mouse on it.

Maximize Button : When you click the mouse on this button, window enlarges to the size of the monitor screen and the button gets converted to Restore button. When you click the mouse on Restore button, enlarged Window gets back to its original size.

Close Button : When you click the mouse on this button, program terminates. Its window and task bar button, both get removed from the monitor screen.

Bar Menu

Bar menu appears as broad strip with multiple options in it. Each option has an underlined character in it. For example, File option has F character, underlined in it. When you select any option, a pull down menu (submenu) appears on the monitor screen. To select any option from the bar menu, either of the following operations can be performed:

1. Click the mouse on the option, which you wish to select.
2. Press Alt key and underlined character key together. For example, to select File option, you could press Alt and F keys together.

Toolbar

Toolbar comprises of many buttons. Each button performs a specific task, when you click the mouse on it. For example, when you click the mouse on "Save" button, current contents get saved on the disk. When you rest the mouse pointer for some time on any button of the tool bar, its name appears on the monitor screen.

Status Bar

Status bar appears at the foot of the window. Relevant information, help messages, current activity status etc. get displayed in it.

OPERATING UPON A WINDOW

Any window that appears on the screen can be operated upon in many ways. Following are the operations that can be performed on a window.

Moving The Window

Window can be moved from one place to another on the screen by dragging it with its title bar and dropping it at the desired location.

Changing The Size Of The Window

Dragging the window by its border, changes its length, width or both. For example, if you place the mouse pointer on window's right borderline and drag it towards left/right, its width will decrease/increase. Similarly if you place the mouse pointer on top borderline and drag it above/below, its length will increase/decrease. If you wish to increase/decrease the length and width of the window simultaneously, in proportion, drag the window by placing the mouse pointer on any of its corners.

Minimizing The Window

To minimize a window, click the mouse on its "Minimize" button. When you do so, it shrinks to a button in Task Manager Area and gets removed from VDU.

Restoring The Minimized Windows

To restore a minimized window, right click the mouse on its button present in Task Manager Area. When you do so, a short cut menu, as shown in figure 5.5 appears on the monitor screen.

Select "Restore" option from this menu. When you do so, minimized window returns back to its original status.

Maximizing The Windows

To maximize a window, click the mouse on its "Maximize" button. When you do so, its size gets enlarged to the size of monitor screen and Maximize button gets converted into Restore button.

Restoring The Maximized Windows

To restore the maximized window, click the mouse on Restore button. When you do so, it returns back to its original size and Restore button gets converted into Maximize button.

Closing The Windows

To close the window and terminate the program, click the mouse on its Close button.

PRACTICAL

ASSIGNMENT -1

(a) Starting a Program, Running a program.

- (i) To start a program from desktop, double click the mouse on an icon, present on desktop. For example, click the mouse on "My Computer" icon present on desktop.
- (ii) To start a program from Quick Launch toolbar, click the mouse on its icon, present in Quick Launch toolbar. For example, click the mouse, on "Internet Explorer" icon.
- (iii) To start a program from System Tray, double click the mouse on its icon that remains present in System Tray. For example, double click the mouse, on Time that gets displayed in System Tray.
- (iv) To start a program from a Start menu, click the mouse on "Start" button and select the desired option from the submenu or submenus that appear thereafter.
- (v) To run a program by specifying its name, first click the mouse on "Start" button and then on "Run" option.

When you do so, a dialog box will appear on screen. Type the name of the program that you wish to run, along with its path name in this dialog box and click the mouse on "OK" button.

(b) Starting Windows in safe mode.

- (i) To boot the computer with Windows in safe mode, first switch the monitor on and then switch on the CPU.
- (ii) Wait for a while and press F8 key. When you do so, a list of booting options will appear on monitor screen. Select "Safe Mode" option from this list.
- (iii) When you do so, computer will get booted in safe mode.
- (iv) Note that safe mode of Windows is restricted mode. Only few basic operations can be performed in this mode. Usually it is used for system maintenance purpose.

(c) Running multiple programs and switching between windows.

- (i) Invoke My Computer program, Internet Explorer, Date and Time program, MS-Word program and Notepad program, using methods described in point (a).
- (ii) To switchover from one program to another, perform any one of the following:
 - Click the mouse on program window's title bar.
 - Click the mouse on program's button present in task manager area.
 - Press Alt key and select the name of the program by pressing Tab key as

many times as required.

(d) Moving the window, and the task bar.

- (i) To move the window, drag it by placing the mouse pointer on its title bar.
- (ii) To move the task bar, drag it by placing the mouse pointer on some blank space of the task bar. Note that you will be able to move it only if it is not locked. Procedure for locking and unlocking the task bar is explained ahead.

(e) Startup to MS-DOS prompt.

- (i) Perform following steps, to invoke MS-DOS prompt:
 - Click the mouse on "Start" button. When you do so, Start menu, as shown in figure 5.3 will appear on the screen.
 - Select "Run" option from it. When you do so, a dialog box, as shown in figure 5.6 will appear on the screen.

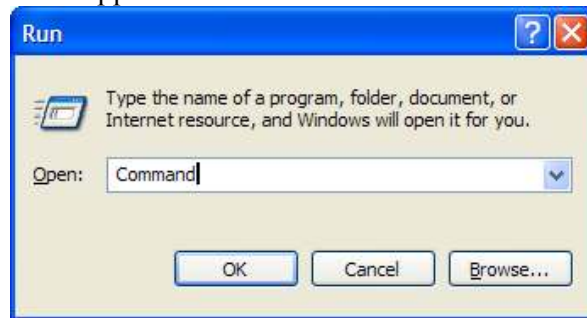


Figure 5.6

- Now type "Command" in the text box.
- At last, click the mouse on "OK" button.

When you do so, MS-DOS screen will appear for working in MS-DOS. To come back to Windows environment, type "Exit" command on system prompt and press "Enter" key.

ASSIGNMENT -2

(a) Creating and removing a folder.

- (i) Perform following steps to create a new folder on desktop:
 - Right click the mouse at some blank space of the desktop. When you do so, a menu as shown in figure 5.7 (a) will appear on the screen.

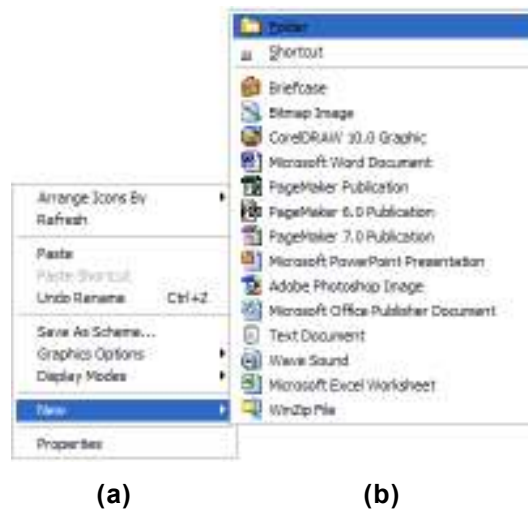


Figure 5.7

- Now select "New" option from this menu. When you do so, a submenu, as shown in figure 5.7 (b) will appear on the screen.
 - Select "Folder" option from this submenu. When you do so, a new folder will get created on desktop. The name, "**New Folder**" will be automatically assigned to this folder.
 - Now, type the name of your choice and press "Enter" key. For example, type "Letter" if you wish to assign the name Letter to new folder and press "Enter" key.
- (ii) Perform following steps to delete a folder:
- Right click the mouse on the folder, which is to be deleted. When you do so, a menu, as shown in figure 5.8(a) will appear on the screen.

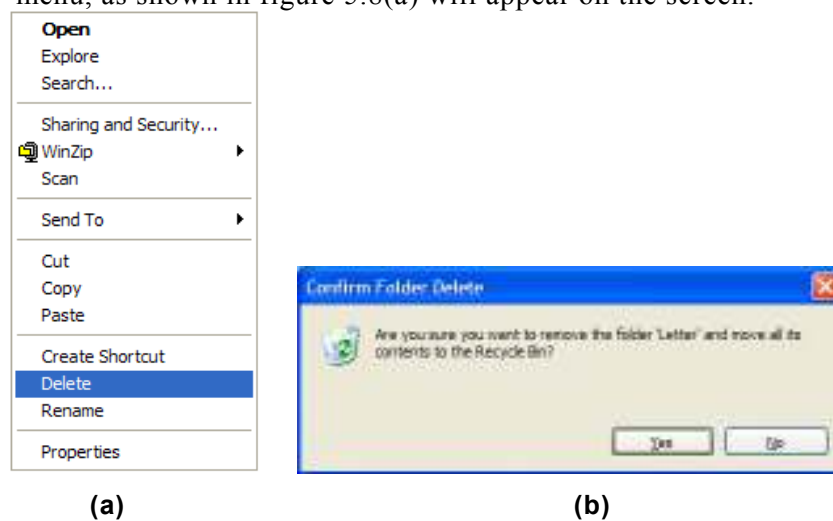


Figure 5.8

- (ii) Now select "Delete" option from this menu. When you do so, a confirmation box, as shown in figure 5.8(b) will appear on the screen.
- If you wish to delete the folder, click the mouse on "Yes" button else click it on "No" button.

Note that when you delete a file or folder then it does not get physically deleted from the disk but it goes and gets stored in Recycle bin. When you delete the file from Recycle bin then only the file gets deleted from the disk. Recycle bin in the form of an icon remains available on your desktop. If you wish, you can recover the deleted items from Recycle bin.

(b) Making the taskbar wider, arranging icon on the desktop.

- (i) To make the taskbar wider, place the mouse pointer on upper border of the taskbar. When you do so, mouse pointer will get converted into double-headed arrow.

Now drag the mouse upward. This will make the taskbar wider.

If you perform the same procedure but drag the mouse downwards, the taskbar will become thinner.

- (ii) Perform following steps to rearrange the icons on desktop:
 - Right click the mouse on some blank portion of the desktop. When you do so, a shortcut menu, as shown in figure 5.7(a) will appear on the screen.
 - Select "Arrange Icon By" option from this menu. When you do so, another popup menu, as shown in figure 5.9 will get displayed on the screen.

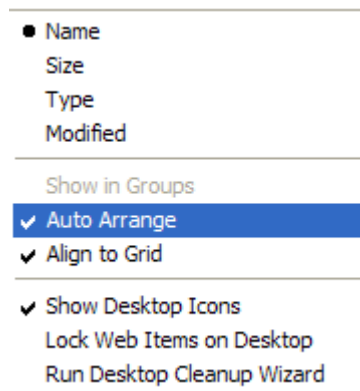
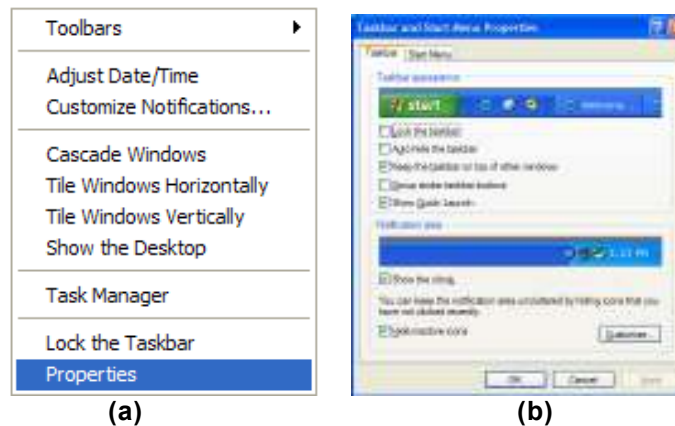


Figure 5.9

- Select "Auto Arrange" option from this menu.
- This procedure will rearrange the icons on desktop.

(c) Displaying and hiding the taskbar clock.

- (i) Perform following steps for hiding or displaying the system clock in taskbar:
 - Right click the mouse on some blank portion of the taskbar. When you do so, a shortcut menu, as shown in figure 5.10(a) will appear on the screen.

**Figure 5.10**

- Select "Properties" option from this menu. When you do so, a dialog box, as shown in figure 5.10 (b) will get displayed on the screen.
- Check "Show the clock" check box to display the clock or uncheck it to hide the clock.
- At last, click then mouse on "OK" button.

(d) Controlling the size of Start menu options:

- Right click the mouse on some blank portion of the taskbar. When you do so, a shortcut menu, as shown in figure 5.10(a) will appear on the screen.
- Select "Properties" option from this menu. When you do so, a dialog box, as shown in figure 5.10(b) will get displayed on the screen.
- Click the mouse on "Start Menu" tab. When you do so, options within the dialog box will change and "Customize" button will appear in it.
- Click the mouse on "Customize" button. When you do so, a dialog box, as shown in figure 5.11 will appear on the screen.
- Make use of "Number of programs on Start menu:" spinner and set the number of programs that should appear in Start menu.
- Click the mouse on "Advanced" tab and select the names of all those programs that you wish to keep in "Start" menu.
- Click the mouse on "OK" button. When you do so, you will be taken back to the dialog box, shown in figure 5.10(b).
- At last, click the mouse on "OK" button.

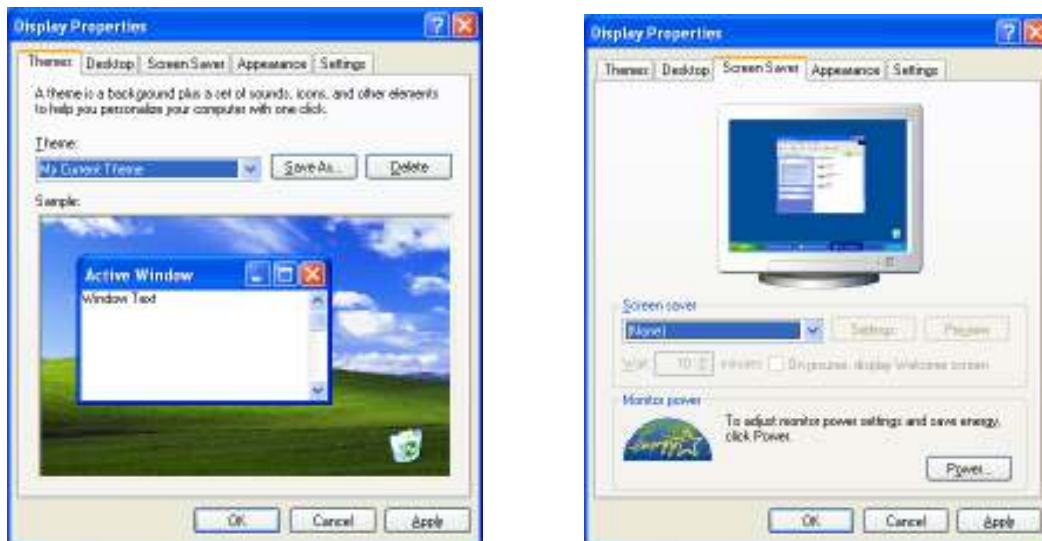
**Figure 5.11**

(e) Creating Shortcuts.

- (i) Perform following steps to create the shortcut of any object whose icon is visible on the screen:
- Right click the mouse on the icon of the program, whose shortcut is to be created. When you do so, a menu, as shown in figure 5.8(a) will appear on the screen.
 - Select "Create Shortcut" option to create the shortcut at the same place where the object is.
 - First select "Send To" option and then "Desktop (create shortcut)" option from the menu that appears thereafter to create the shortcut on desktop.

ASSIGNMENT -3**(a) Installing a screen saver.**

- (i) Perform following steps to set the screen saver:
- Right click the mouse on any empty place of Desktop. When you do so a menu, as shown in figure 5.7(a) will appear on monitor screen.
 - Now select "Properties" option from this menu. When you do so, a dialog box, as shown in figure 5.12(a) will appear on monitor screen.



(a)

(b)

Figure 5.12

- Click then mouse on "Screen Saver" tab. When you do so, another dialog box, as shown in figure 5.12(b) will appear on monitor screen.
- Select the screen saver of your choice from "Screen Saver" drop down list box.

- Now make use of "Wait" spinner and specify the time after which the screen saver should get activated, if no input/output activity takes place. For example, if you specify this limit as 10 minutes and no input/output activity takes place for 10 minutes then screen saver will automatically get activated.
- Using "Settings" button, set other related options. For example, what should be the speed of moving patterns, what should be their shape etc, can be set by clicking the mouse on this button.
- Now click the mouse on "OK" button.

(b) Assigning wallpaper to Desktop.

- Perform following steps to set the wallpaper for the desktop:
 - Right click the mouse on any empty place of desktop. When you do so, a menu, as shown in figure 5.7(a) will appear on monitor screen.
 - Now select "Properties" option from this menu. When you do so, a dialog box, as shown in figure 5.12(a) will appear on monitor screen.
 - Click the mouse on "Desktop" tab. When you do so, options within the dialog box will change, as shown in figure 5.13.
 - Select the background from Background list box. If some other background than those available in list box, is to be set then make use of "Browse..." button.
 - Now set the position and color, using respective drop down lists present in the dialog box.
 - Now click the mouse on "OK" button.



Figure 5.13

(c) Adding a program to the Start menu.

- Perform following steps for adding a program to the Start menu:
 - Create a shortcut of the program on desktop, using the method describe above.
 - Drag the shortcut and drop it on Start menu.

(d) Recovering files and folders from Recycle bin.

- Perform following steps for recovering files and folders from Recycle bin:
 - Double click the mouse on "Recycle Bin" icon that remains present on desktop. When you do so, Recycle Bin window with many options and deleted file/folder icons will appear on monitor screen.

- (e) Customizing the mouse settings.*

- Click the mouse on "Start" button. When you do so, "Start" menu, as shown in figure 5.3 will appear on the screen.
- Select "Control Panel" option from this menu. When you do so, a window containing many program icons in it will appear on the screen.
- Now double click the mouse on "Mouse" icon. When you do so, a dialog box, as shown in figure 5.14 will appear on the screen.



ASSIGNMENT -4

(i) Perform following steps for expanding and collapsing a folder:

-
- Left Pane
- Right Pane

Figure 5.15

Note that the names of the folders get displayed in left pane and contents of the current folder in right pane.

- To expand any folder, click the mouse on + sign that remains present on the left hand side of the folder icon.
- To collapse any folder, click the mouse on - sign that remains present on the left hand side of the folder icon.

(b) Recognizing file types, using icons.

- (i) Following are the icons that symbolize different types of files and devices:



Represents Floppy drive.



Represents hard disk.



Represents a folder.



Represents executable file.



Represents non-executable files.



Represents data file.



Represents MS-Word file.



Represents MS-Excel file.



Represents MS-Power Point file.



Represents MS-Access file.



Represents sound or video file.

(c) Running a program from Explorer.

- (i) To run a program from Explorer, double click the mouse on its icon present in right pane of Explorer window.

(d) Renaming a file or folder.

- (i) Perform following steps for renaming a file or folder:

- Right click the mouse on the icon of the file/folder, which gets displayed in right pane of Windows Explorer. When you do so, a popup menu, as shown in figure 5.8(a) will appear on the screen.
- Select "Rename" option from this menu and type the new name of the file.
- At last press "Enter" key.

(e) Selecting two or more files for an operation.

- Perform following steps for selecting two or more file for an operation:
 - To select contiguous block of files (say from fifth file to eleventh file), press Shift key and first click the mouse on first file (fifth file) of the block and then on the last file (eleventh file) of the block.
 - To select multiple files (say fifth, seventh and ninth file), keep holding Ctrl key and click the mouse on each file that is to be selected (i.e. fifth, seventh and ninth file).

ASSIGNMENT - 5

(a) Displaying the properties of a file or folder.

- Perform following steps for displaying the properties of a file or folder:
 - Right click the mouse on the icon of the file/folder, which gets displayed in right pane of Windows Explorer. When you do so, a popup menu, as shown in figure 5.8(a) will appear on the screen.
 - Select "Properties" option from this menu. When you do so, properties of file and folder will get displayed in a dialog box. Such a dialog box is shown in a figure 5.16.

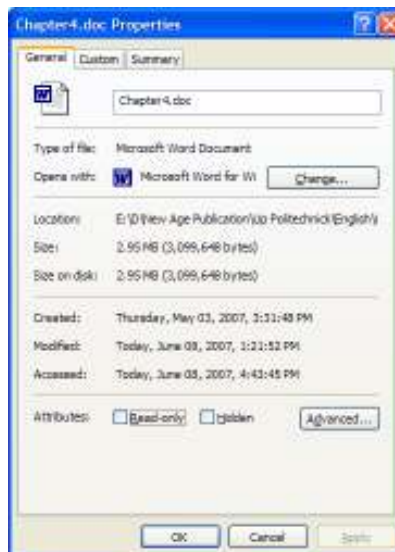


Figure 5.16

(b) Using cut and paste operations to move a file.

- (i) Perform following steps for moving a file from one folder to another:
 - Click the mouse on that folder (present in left pane of Windows Explorer window), which contains the file that you wish to move. When you do so, all its files and folder will get displayed in right pane of Windows Explorer window.
 - Right click the mouse on the file (present in right pane of Windows Explorer window) that is to be moved. When you do so, a popup menu, as shown in figure 5.8(a) will appear on the screen.
 - Select "Cut" option from this menu.
 - Now right click the mouse on that folder (present in left pane of Windows Explorer window), in which the file is to be moved. When you do so, a popup menu, as shown in figure 5.8(a) will appear on the screen.
 - Select "Paste" option from this menu.

(c) Using copy and paste operations to copy a file.

- (i) Perform following steps for copying a file from one folder to another:
 - Click the mouse on that folder (present in left pane of Windows Explorer window), which contains the file that you wish to copy. When you do so, all its files and folder will get displayed in right pane of Windows Explorer window.
 - Right click the mouse on the file (present in right pane of Windows Explorer window) that is to be copied. When you do so, a popup menu, as shown in figure 5.8(a) will appear on the screen.
 - Select "Copy" option from this menu.
 - Now right click the mouse on that folder (present in left pane of Windows Explorer window), in which the file is to be copied. When you do so, a popup menu, as shown in figure 5.8(a) will appear on the screen.
 - Select "Paste" option from this menu.

(d) Moving and copying files with mouse.

- (i) For moving the file from its current location to another folder, drag the file icon with Shift key pressed and drop it on the folder, in which the file is to be moved.
- (ii) For copying the file from its current location to another folder, drag the file icon with Ctrl key pressed and drop it on the folder, in which the file is to be copied.

(e) Sorting a folder.

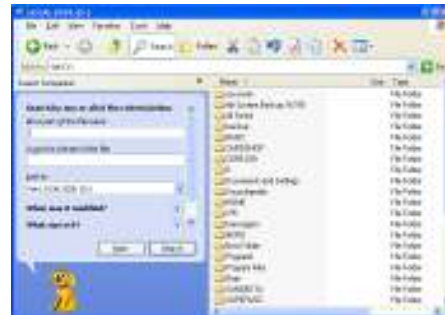
- (i) Perform following steps for sorting a folder:
 - Click the mouse on that folder (present in left pane of Windows Explorer

Select "View" option from bar menu. When you do so, View menu will appear on the screen.

- ## ANNEXMENT - 6

(a) *Finding a file or folder by name.*

-

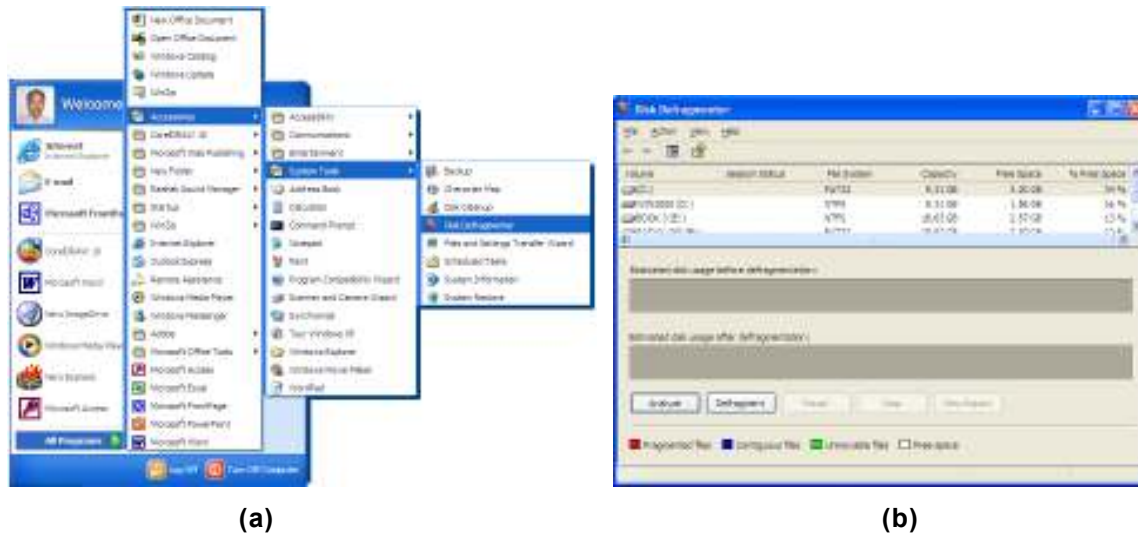


(a)

- (b)

(i) Perform following steps for defragmenting the disk, using disk defragmenter:

- Click the mouse on "Start" button. When do so, Start menu, as shown in figure 5.18 (a), will appear on the screen.
- First select "All Programs" option from this menu and then "Accessories", then "System Tools" and then "Disk Defragmenter" option from the submenus that appear one after the other.
- When you do so, a dialog box, as shown in figure 5.18(b), will appear on the screen.

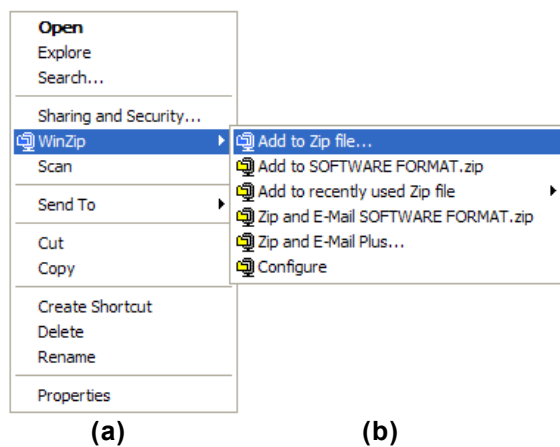
**Figure 5.18**

- Click the mouse on "Defragment" button.

When you do so, Windows will start the defragmentation process. Note that defragmentation is a long and time-consuming process. Total time taken to defragment the whole disk will depend upon the size of the disk and file population on it.

(c) Compressing a file using WinZip.

- Perform following steps for compressing a file, using WinZip:
 - Right click the mouse on file/folder, which is to be compressed. When do so, a menu, as shown in figure 5.19(a), will appear on the screen.

**(a)****(b)****Figure 5.19**

- Now select "WinZip" option from this menu. When you do so, another menu, as shown in figure 5.19(b) will appear on the screen.
- Now select "Add to Zip file..." option from this submenu. When you do so, a dialog box, as shown in figure 5.19(c) will appear on the screen.
- Enter the name that you wish to assign to the compressed file in "Add to archive" text box.
- Click the mouse on "Add" button. When you do so, WinZip window will appear on the screen.
- Now close this window.

(d) Controlling the speaker volume.

- (i) Perform following steps for controlling the speaker volume:
 - Click the mouse on speaker icon that remains present in system tray. When you do so, a slider, as shown in figure 5.20 will appear on monitor screen.

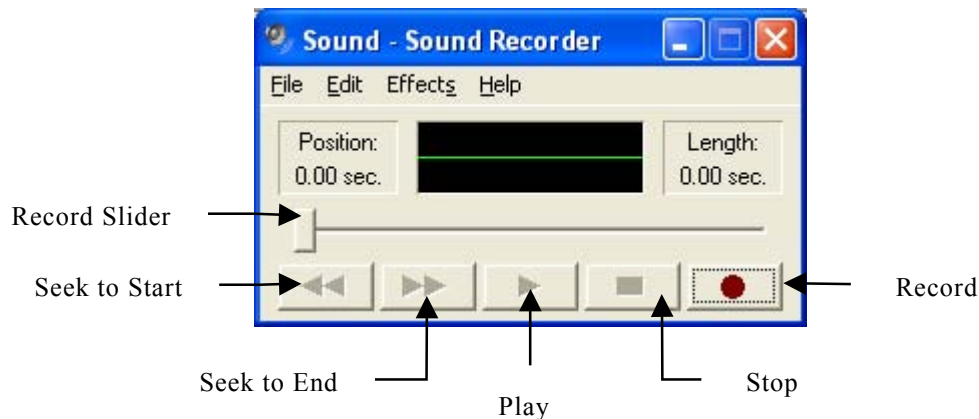


Figure 5.20

- Drag the slider upwards for increasing the volume. Dragging it down will decrease the volume.

(e) Recording and saving an audio file.

- (i) Perform following steps for recording and saving an audio file:
 - Click the mouse on "Start" button. When you do so, a menu, as shown in figure 5.18(a) will appear on the screen.
 - Select "All Programs" option from this menu. When you do so, a submenu, as shown in figure 5.18(a) will appear on the screen.
 - Select "Accessories" option from this submenu. When you do so, a submenu, as shown in figure 5.18(a) will appear on the screen.
 - Select "Entertainment" option from this submenu. On doing so, another submenu will appear on the screen.
- (ii) Now, select "Sound Recorder" option from this submenu. On selecting this option, sound recorder will appear on the screen, as shown in figure 5.21.

**Figure 5.21**

- To start recording the sound, click the mouse on "Record" button. When you do so, recording will start and the record slider will start moving forward. Whatever will be spoken or sung in front of microphone, will get recorded.
 - In order to stop the recording, click the mouse on "Stop" button.
 - To play the sound that you just recorded, click the mouse on "Play" button. When you do so, you will hear the recorded sound through speakers.
 - After playing the sound once, if you wish to go to the beginning of the recording, click the mouse on "Seek to Start" button. Similarly if you wish to go to the end of the recording, click the mouse on "Seek to End" button.
- (ii) Perform following steps for saving the recording in a file
- Select "File" option from the bar menu of the sound recorder. When you do so, File submenu will appear on the screen.
 - Select "Save" or "Save As" option from File submenu. When you do so, a dialog box, will appear on the screen.
 - From this dialog box, select the name, the drive and folder, in which you wish to save the file.
 - Type the name of the file in "File name" text box.
 - Now click the mouse on "Save" button. When you do so, the sound file will get stored in the specified file.

Computer Application Laboratory

CHAPTER 6

MS-WORD

MS-Word is word processing software that has been designed and developed by Microsoft Corporation of USA. It is mainly used for entering the text in computer and formatting it in presentable form. Its working details are described in this chapter.

OPENING A NEW DOCUMENT AND TYPING THE TEXT

For getting started with MS-Word, perform following steps:

1. Click the mouse on "Start" button. When you do so, a menu, as shown in figure 6.1(a) will appear on the screen.
2. Select "All Programs" option from this menu. When you do so, a submenu, as shown in figure 6.1(b) will appear on the screen.
3. Select "Microsoft Word" option from this submenu.

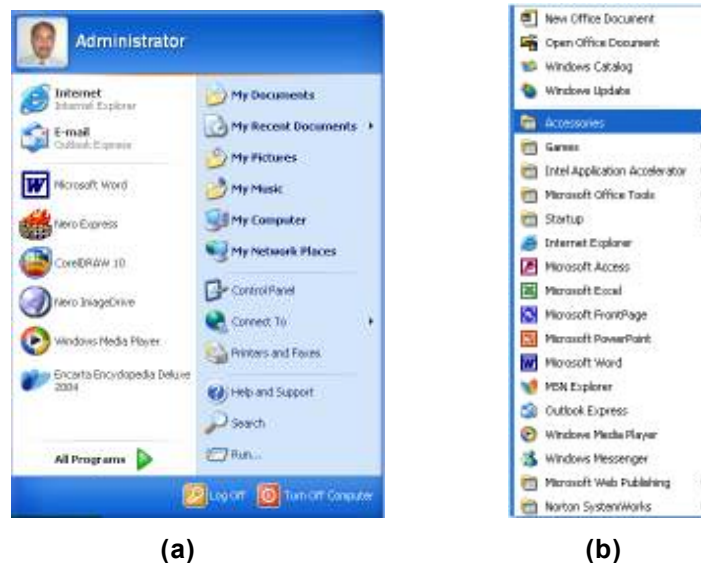


Figure 6.1

When you do so, a window, as illustrated in figure 6.2 will appear on the screen. This window is called Word Window.

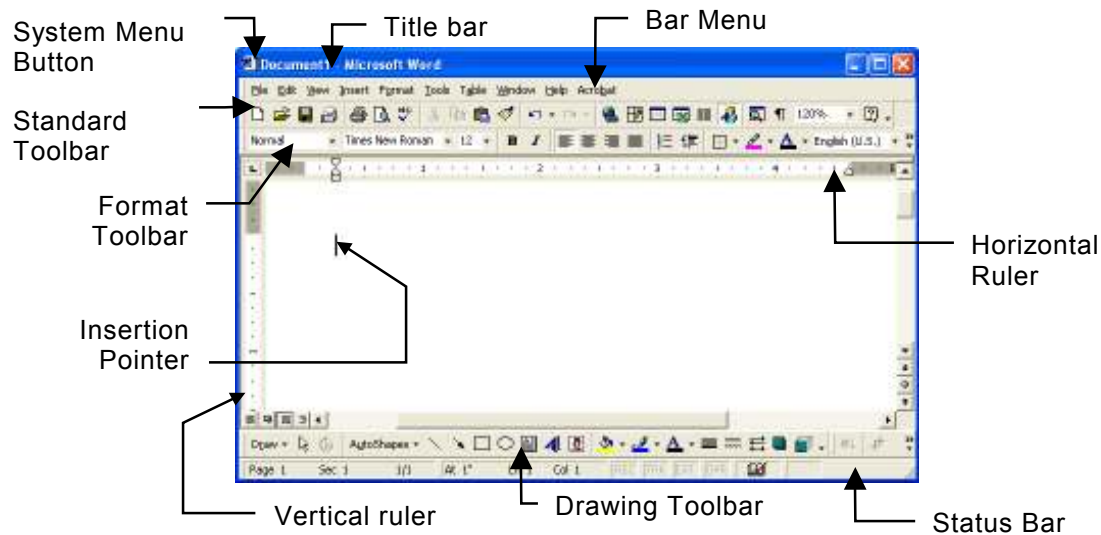


Figure 6.2

PAGE LAYOUT SETTING

The process of setting the margins and paragraphs etc. is called page setting. Rulers are the best medium for setting the page layout. An exclusive view of horizontal ruler is shown in figure 6.3.

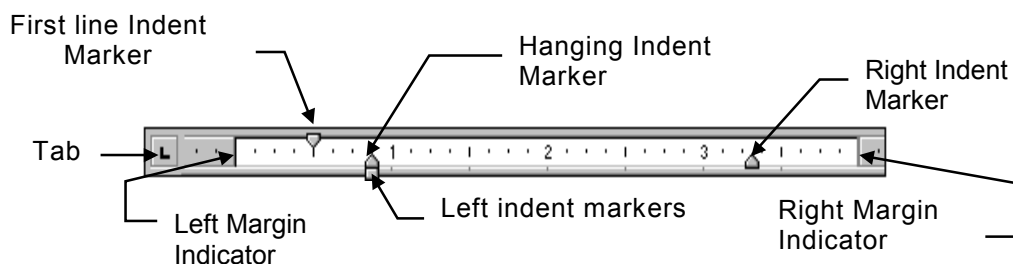


Figure 6.3

Setting Left and Right Margins

Left and Right Margins indicators are used for setting respective margins of the document. For example, if Right Margin Indicator's position is set to one inch then the width of the left margin, for the whole document will be one inch. To change the width of the margin, you can drag the respective indicator to the desired place, with the help of mouse.

Setting Hanging Indent For Paragraph

Usually all the paragraphs of the document start from left margin but Hanging Indent

Marker provides the facility to start the current paragraph from a different position. It could be dragged to a new position to define the starting place for the current paragraph. For example, if the right margin has been set to 1 inch and Hanging Indent Marker has been positioned at 1.5 inch then all the paragraphs other than the current paragraph will start from 1 inch but the current paragraph will start from 1.5 inch.

Setting First Line Indent

First line Indent Marker provides the facility to start the first line of the paragraph from a place other than that from where rest of the lines of the paragraph start. For example, all the lines of the paragraph may start from the left margin (say 1 inch) but first line for the paragraph may start from 1.5 inch from the left margin. To set the position of the first line of the paragraph, First Line Indent Marker can be dragged to the desired position.

Setting Left Indent

Left Indent Marker facilitates simultaneous movement of First line Indent Marker and Hanging Indent Marker. When you drag it, both the markers move together in the same direction and by the same distance.

Setting Tab

Tab button, present in horizontal ruler, facilitates setting of tab positions for the Tab key. To set the tab positions, first click the mouse on Tab button and then click it at the desired position in the ruler. This will put a mark in the ruler and set the tab position. When you press the tab key, insertion pointer will jump to the set-tab-position. For example, if you set the tab positions at 3, 5 and 7 inches then pressing the Tab key once will take the mouse pointer to a place 3 inches away from left margin. When you press it again it will move 5 inches away and if you press it again, it will move it by 7 inches. To remove a tab position, drag the tab mark and drop it off the ruler.

TYPING THE TEXT

When you press any key of the keyboard, character gets typed at current cursor position. Thus by pressing different keys of the keyboard, you can type the complete letter, document, or report.

While entering the text, when insertion pointer reaches the right margin, it automatically gets placed in first column of the next line. When current VDU screen becomes full of text, document automatically shifts upwards (this process is called scrolling) and blank line appears at the bottom of the screen, where you could further enter the text.

When current page becomes full, insertion pointer gets automatically placed at the beginning of the next page. Thus, continuing in this way, you can enter the text, page after page.

While entering the text, you can always make use of Del and Backspace keys to erase characters, words or sentences.

To insert the text in between two characters, words, sentences or paragraphs, click the mouse at the place where the text is to be inserted. When you do so, insertion pointer will get placed there. Now whatever you type, will get typed in between and the text on the right hand side will automatically shift.

To overwrite on already entered text, first double click the mouse on OVR button, present in status bar and then type the text. To come back to Insert mode, click the mouse on the same button again.

To start a new paragraph, press Enter key.

SAVING THE TEXT IN A FILE

Perform following steps to save the text in a file:

1. Select "File" option from bar menu. When you do so, File submenu will appear on the screen.
2. Now select "Save" option from the File submenu. When you do so, a dialog box, as illustrated in figure 6.4, will appear on the screen.
3. Select the drive and the folder, in which the file is to be saved.
4. Enter the name of the file in "File Name" text box.
5. Click the mouse on "Save" button.

When you do so, current text will get saved on the selected disk, in specified folder and file.

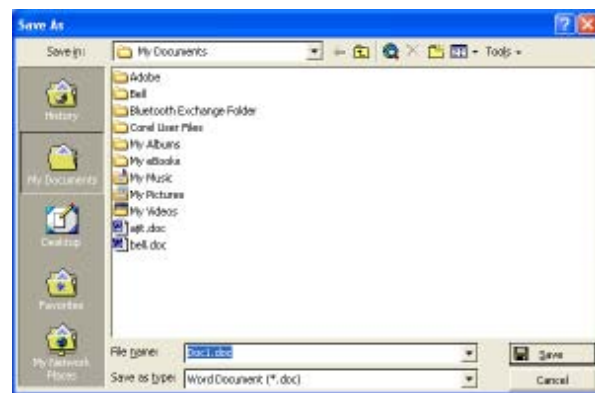


Figure 6.4

CLOSING THE FILE

Perform following steps to close currently opened file:

1. Select "File" option from the bar menu. When you do so, File submenu will appear on the screen.
2. Select "Close" option from File submenu.

If no additions or modifications have been made in the document, ever since it was last saved, file will get closed. On the other hand, if they were made, an Alert box, as illustrated in figure 6.5, will appear on the screen.

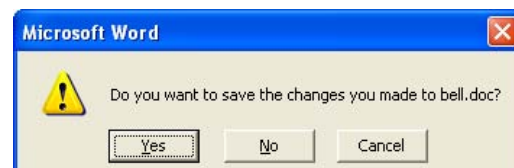


Figure 6.5

3. Click the mouse on "YES" button, if you wish to save the additions and modification on the disk. Select "No" button for not saving them. If you wish to cancel the idea of closing the file, click the mouse on "Cancel" button.

Whatever text you save in the file, remains permanently available for use.

EDITING OPERATIONS

After opening the file, you may wish to make few modifications in it. For example, you may wish to delete few lines or you may wish to copy a part of the text from one place to another or you may wish to move few lines of paragraphs from here to there. For performing all such types of editing operations, you will have to first select the text, on which you wish to perform the operation. MS-Word provides different mechanisms for selecting different portions of the text. They are explained below.

Selecting The Text

To select any portion of the text, drag the mouse over it. To cancel the selection either click the mouse anywhere in the document or press any arrow key of the keyboard.

Deleting The Text

Different parts of the text can be deleted differently. Various deletion operations are explained below:

1. To delete a word after the insertion pointer, press CTRL and DEL keys together.
2. To delete a word before the insertion pointer, press CTRL and Backspace keys together.
3. To delete a desired portion of text (either text or graphics), select it, using any of the methods mentioned above and then press DEL key.

Copying The Text (Copy And Paste)

Often while entering the text, you may wish to copy certain portion of the text (that has already been typed) to another place, so that you don't have to type the matter again. For this, you need to perform following steps:

1. Select the text that you wish to copy.
2. Select "Edit" option from the bar menu. On doing so, Edit submenu, as shown in figure 6.6, will appear on the screen.
3. Select "Copy" option from this submenu.
4. Now take the insertion pointer to the place, where you wish to copy the selected text.
5. Select "Edit" option again from the bar menu and get Edit submenu, as shown in figure 6.6, on the screen.
6. Now select "Paste" option from this submenu.

When you do so, selected text will get copied at current insertion pointer's position.

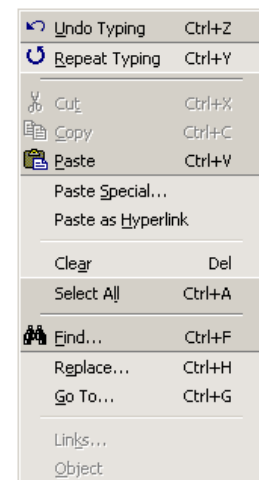


Figure 6.6

Moving The Text (Cut And Paste)

Often while entering the text, you may wish to change the location of certain portion of the text. For this, you need to perform Paste operation, as mentioned below.

1. Select the text that you wish to move to other location of the document.
2. Now right click the mouse on selected portion. When you do so, a popup menu, as shown in figure 6.7 will appear on the screen.
3. Select "Cut" option from this menu.
4. Now take the insertion pointer to that part of the document, where the text is to be moved.
5. Right click the mouse again and get the popup menu, shown in figure 6.7, on the screen.
6. Select "Paste" option from this menu.

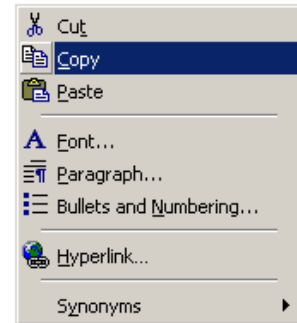


Figure 6.7

When you do this, selected text will shift its place from its original position to current insertion pointer's position.

Replacing The Word With Another Word

To find the occurrence of a word and replacing it with another word, MS-Word provides replace facility. Replacement of a word, using this facility can be done as mentioned below:

1. Select "Edit" option from the bar menu. When you do so, Edit submenu, as shown in figure 6.6, will appear on the screen.
2. Select "Replace..." option from Edit submenu. When you do so, a dialog box, as shown in figure 6.8, will appear on the screen.
3. Enter the word that is to be replaced, in "Find What" text box. For example, you enter the word, "Dynamic" in it.
4. Enter the new word in "Replace with" text box. For example, if you wish to replace the word "Dynamic" with the word "Energetic", enter "Energetic" in "Replace with" text box.
5. If you wish to specify more details related to replacement, click the mouse on "More" button. When you do so, other options will appear on the screen.

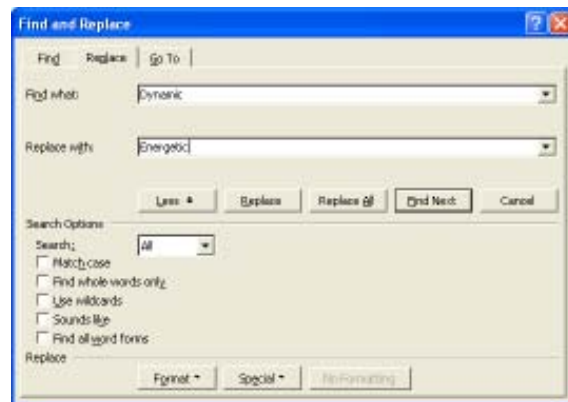


Figure 6.8

6. For replacing the single occurrence of the word, click the mouse on "Replace" button and for changing all the occurrences in one-go, click it on "Replace All" button.

When the Replacement operation is over, "Cancel" button automatically changes to "Close" button. By choosing "Close" button, you can close the search operation and return back to the document.

FORMATTING THE TEXT

Formatting the document means arranging the contents of the document (such as text, graphics etc.) in such a way that the document looks attractive. For example, changing the font, font size, line spacing, paragraph spacing etc. are the activities, which fall into the category of formatting. In MS-Word, formatting operations are done using Format toolbar that remains present in Word window. Format toolbar is shown in figure 6.9. How formatting functions are done using Format toolbars is explained below.

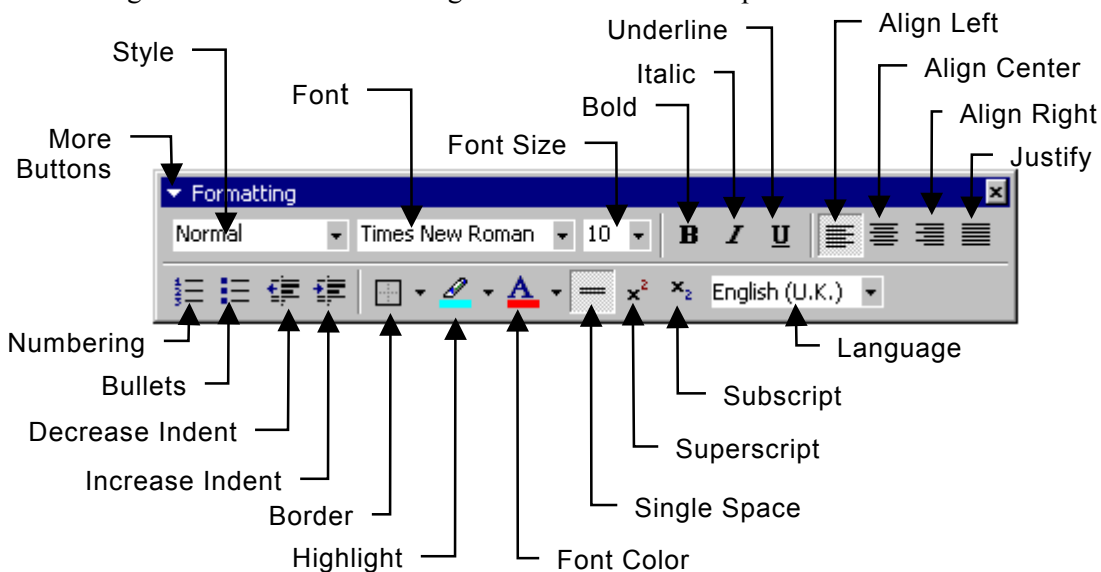


Figure 6.9

To perform any formatting function, select the text, which is to be formatted and click the mouse on the corresponding button.

For example, if you wish to make the first two lines of the text bold, select them and then click the mouse on "Bold" button present in Format toolbar.

To make a bullet list enter each item of the list in a new line, select all the items and click the mouse on "Bullets" button (to remove the bullet, select the list and click the mouse on same button).

Similarly you can perform other formatting operations.

Header Footer and Page Number

Header or Footer are the items like text, graphic or number, which are printed on top or bottom of every page of the document, respectively. Perform following steps to introduce them in the document:

1. Select "View" option from the bar menu. When you do so, View submenu, will appear on the screen.
2. Select "Header and Footer" option from View submenu. When you do so, header and footer toolbar along with Header/Footer edit box, as shown in figure 6.10, will appear on the screen.

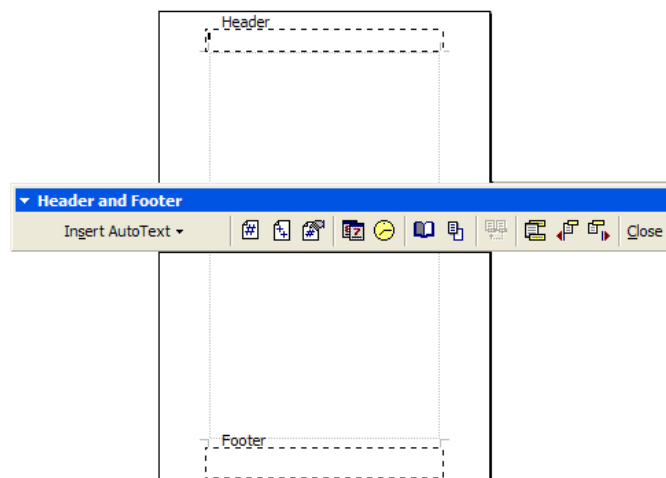


Figure 6.10

3. Whether the forthcoming entry will be for header or footer, define that by clicking the mouse on "Switch Between Header and Footer" button, as it alternates between them.
4. Enter header/footer text in the respective area.
5. If you wish to include current date or time as header or footer, click the mouse on respective buttons present in "Header and Footer" toolbar.
6. To include the page number, take the insertion pointer to that place, where you wish the page numbers to appear and then click the mouse on "Page Number" button, present in "Header and Footer" toolbar.
7. Generally the page numbers start from 1 and are numbered as 1, 2, 3 etc. In case you want them to start from some other number or want them to appear in different format, such as (a, b, c etc.), click the mouse on "Format Page Number" button. When you do so, another dialog box will appear on the screen. Define all the options of your choice through that dialog box.
8. At last, click the mouse on "Close" button.

When you do so, defined header, footer page numbers etc. will be visible in the pages.

Introducing Borders And Shading

Perform following steps to introduce borders around the selected text and shading in it:

1. Select the text, around which the border is to be introduced.
2. Select "Format" option from the bar menu. When you do so, Format submenu will appear on the screen.
3. Select "Borders and Shading..." option from Format submenu. When you do so, a dialog box, as shown in figure 6.11, will appear on the screen. Somehow, if the options being displayed within the dialog box are different, click the mouse on "Borders" tab.
4. Select the border type, mentioned under "Setting" section of this dialog box. Somehow, if the border is to be removed, select "None" option.
5. Select the style, color and width or the line, using which the border is to be made, through "Style", "Color" and "Width" drop down list boxes respectively.

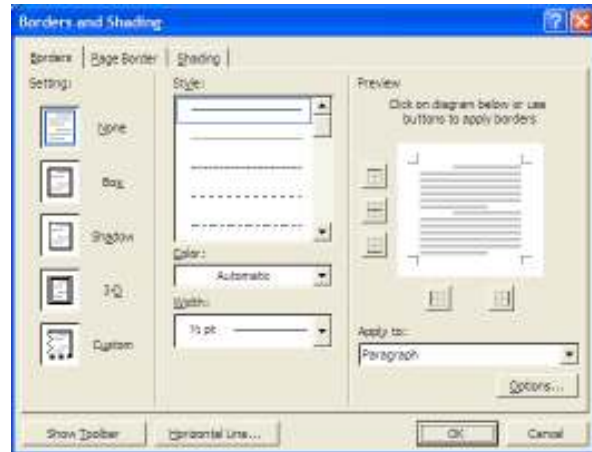


Figure 6.11

Introducing Shading

6. Click the mouse on "Shading" tab. When you do so, options shown within the dialog box will change as shown in figure 6.12.
7. Select the color, using which the background of the border is to be shaded. If somehow shading is to be removed, select "No Fill" option.
8. Select pattern of the color, using "Style" drop down list box.
9. At last, click the mouse on "Ok" button.

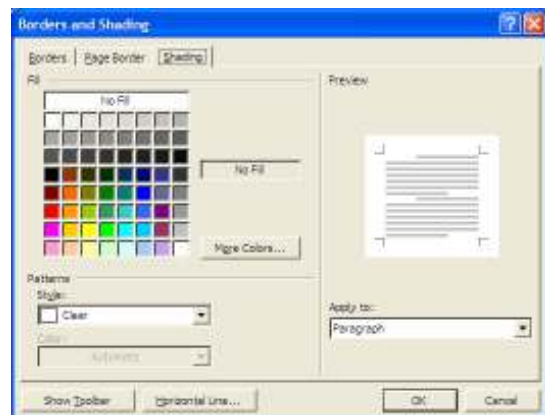


Figure 6.12

When you do so, border with selected colored background will get introduced around the selected text.

Columns

Instead of text running in straight lines from left margin to right margin, it can be arranged

in columns, as is done in newspapers and magazines. Perform following steps to arrange the text in multiple columns:

1. Select the text that is to be arranged in columns.

2. Select "Format" option from the bar menu. When you do so, "Format" submenu will appear on the screen.

3. Select "Columns" option from Format submenu. When you do so, a dialog box, as shown in figure 6.13, will appear on the screen.

4. Select the number of columns that have to appear across the width of the page by clicking the mouse on desired option present in "Preset" section of this dialog box.

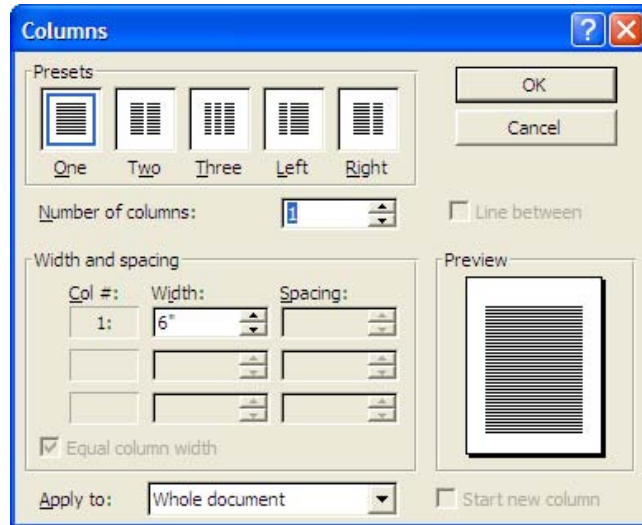


Figure 6.13

5. Select the width of the column and spacing between the columns, using respective spinners present in this dialog box.

6. At last, click the mouse "OK" button. When you do so, text will get arranged in columns.

To remove the columns and arrange the text in normal fashion, perform above mentioned procedure again but select single column option this time, while selecting the number of columns for the page.

Case Conversion

Perform following steps to make case related conversions in the typed text:

1. Select the text, in which case conversion is to be done.

2. Now select "Format" option from the bar menu. When you do so, Format submenu, will appear on the screen.

3. Select "Change Case..." option from Format submenu. When you do so, a dialog box, as shown in figure 6.14 will appear on the screen.

4. Select the desired option from this dialog box and click the mouse on "OK" button.

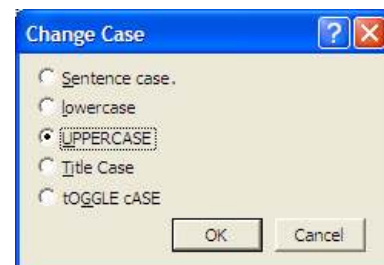


Figure 6.14

When you do so, case of the selected text will change accordingly. The effect of each type of case conversion is shown in table 6.15

Option	Example	Remark
Original Text	good Morning	
Sentence case	Good Morning	First character of sentence gets converted into capital letter.
Lower case	good morning	All alphabets get converted to lower case.
Upper case	GOOD MORNING	All alphabets get converted to upper case.
Title case	Good Morning	First alphabet of each word gets converted to upper case.
tOGGLE cASE	GOOD mORNING	Lower case alphabets get converted to upper case and upper case alphabets get converted to lower case

Table 6.15

Page Breaks

When you enter the text in MS-Word and the current page becomes full, it automatically introduces a page break, called soft page break. It takes the mouse pointer to the beginning of the next page so that whatever you type now, gets typed on the next page. Apart from soft page breaks, you can also introduce additional page breaks, at any desired location of the document. These page breaks are called hard page breaks. Perform following steps to introduce a hard page break, at desired location:

1. Position the insertion pointer, at the place, where you wish to introduce the page break.
2. Select "Insert" option from the bar menu. When you do so, Insert submenu, as shown in figure 6.16, will appear on the screen.
3. Select "Break..." option from Insert submenu. On selecting this option, a dialog box, as shown in figure 6.17, will appear on monitor screen.
4. Select "Page Break" option from this dialog box.
5. At last, click the mouse on "OK" button.

When you do so, this page break will appear like dotted line, in the Normal view mode.

All types of page breaks appear as thick line in Print Layout View mode.

To remove hard page break, select the page break in Normal view mode by clicking the mouse on it and then press Backspace or Del key.

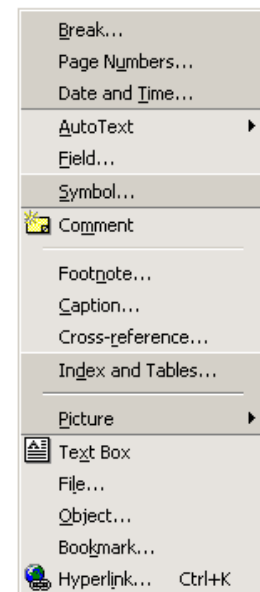


Figure 6.16

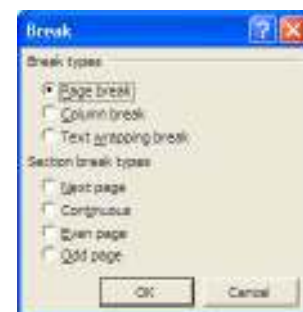


Figure 6.17

INTRODUCTION TO TABLE

Tables are the best means for illustrating classified data. They consist of rows and columns. A blank table is shown in figure 6.18. The unit space formed by the intersection of rows and column is called cell. Thus a table consisting of 3 rows and 4 columns will have 12 cells in it. MS-Word provides facility for creating tables and entering data in them. The method of creating the table and entering data is given below:

	4 columns			
3 Rows				

Figure 6.18

Creating A Blank Table

Perform following steps to create a blank table in the document:

1. Place the insertion pointer at the place, where the table is to be created.
2. Select "Table" option from the bar menu. When you do so, "Table" submenu, as shown in figure 6.19(a), will appear on the screen.
3. Select "Insert" option from Table submenu. On selecting this option, another submenu, as shown in figure 6.19(b), will appear on the screen.
4. Now select "Table" option from this submenu. When you do so, a dialog box, as shown in figure 6.20, will appear on the screen.
5. Make use of different spinners present in the dialog box and specify the dimension of the table. Say you specify 4 column and 3 rows.
6. At last, click the mouse on "OK" button.

When you do so, a blank table structure, as shown in figure 6.18, will get created.

Drawing The Table

Instead of making a table by adopting the procedure mentioned above, you can directly draw a table using "Draw Table" option of Table submenu. Perform following steps to draw a table of your choice:

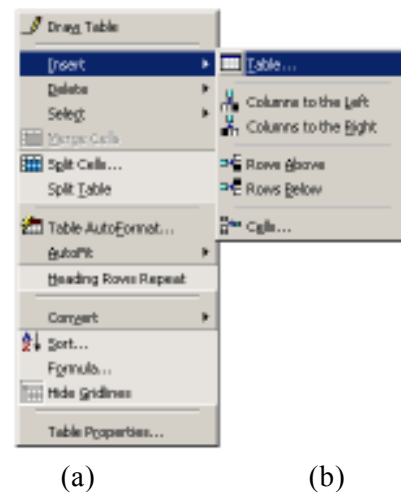


Figure 6.19



Figure 6.20

1. Select "Table" option from the bar menu. When you do so, "Table" submenu, as shown in figure 6.19(a), will appear on the screen.
2. Select "Draw Table" option from Table submenu. On selecting this option, Table and Border toolbar, as shown in figure 6.21 appears on the screen.
3. Make use of different tools of this toolbar and draw the table of your choice by dragging the mouse.

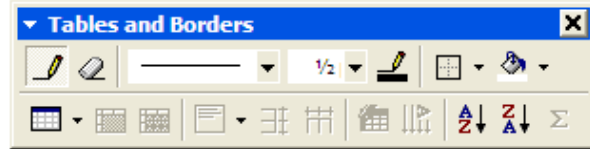


Figure 6.21

Entering Data In Table

To type the data in the table, click the mouse in desired cell and start typing the data from keyboard. Using arrow keys, you can move within the cell. Pressing Tab key moves insertion pointer ahead by 1 cell, while Shift and Tab keys pressed together take the insertion pointer back by one cell.

Inserting A Row

Perform following steps to insert a row in an already existing table:

1. Place the insertion pointer in the row, above which you wish to insert a new row.
2. Select "Table" option from the bar menu. When you do so, a Table submenu, as shown in figure 6.19(a), will appear on the screen.
3. Select "Insert" option from this submenu. On selecting this option, another submenu, as shown in figure 6.19(b), will appear on the screen.
4. Now select "Row Above" option from this submenu.

When you do so, a blank row, above the insertion pointer will get created in the table.

Inserting A Column

To insert a column in an already existing table, place the insertion pointer in the column, left to which, a new column is to be inserted. After this, perform all the steps mentioned in "Inserting a row" section but select "Column to the Left" option instead of "Row above" option in step (4).

Deleting Table Or Row Or Column

Perform following steps to delete the table, row(s) /column(s):

1. Select the table or row or column that is to be deleted.
2. First select "Table" option from the bar menu. When you do so, Table submenu, as shown in figure 6.19 (a) will appear on monitor screen.
3. Select "Delete" option from Table submenu. When you do so, another submenu, as shown in figure 6.22, will appear on monitor screen.
4. Select "Table", "Rows" or "Columns" option from this submenu.

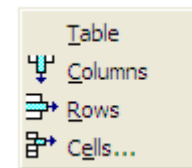


Figure 6.22

When you do so, the selected table, row or column will get deleted.

If you wish to delete the contents of the table/rows/columns and not the entire table/row/column, select the contents and press Del key.

Merging The Cell

Perform following steps to merge two to more cells of the table:

1. Select the all those cells, which have to be merged together.
2. Select "Table" option from the bar menu. When you do so, Table submenu, as shown in figure 6.19(a) will appear on monitor screen.
3. Select "Merge Cells" option from Table submenu. When you do so, all selected cells will be merged together to form a single cells.

Inserting Picture

Perform following steps to insert picture in the document:

1. Click the mouse at that place in the document, where the picture is to be inserted.
2. Select "Insert" option from the bar menu. When you do so, Insert submenu, as shown in figure 6.16 will appear on monitor screen.
3. Select "Picture" option from Insert submenu. When you do so, another submenu, as shown in figure 6.23(a) will appear on the screen.

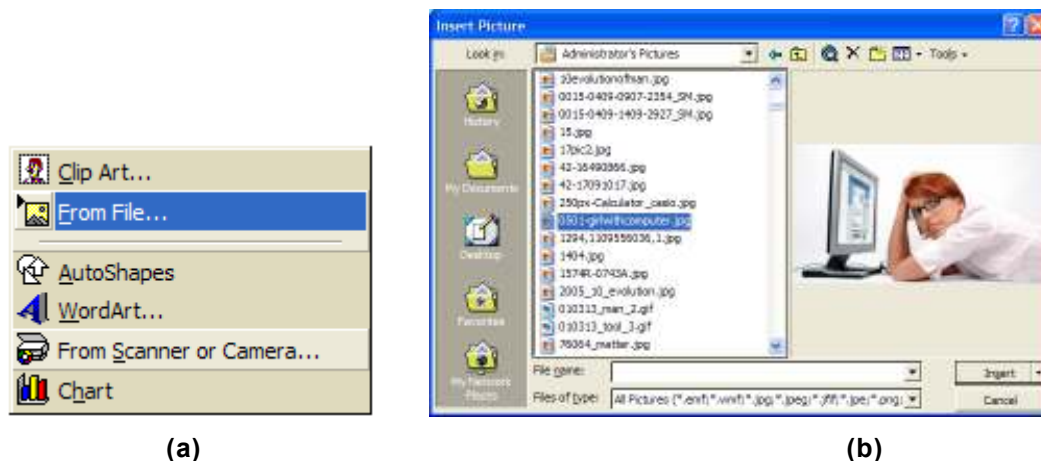


Figure 6.23

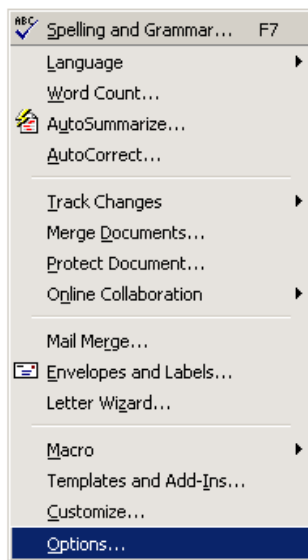
4. Now select "From File..." option from this submenu. When you do so, a dialog box, as shown in figure 6.23(b) will appear on monitor screen.
5. Select desired picture through this dialog box.
6. At last, click the mouse on "Insert" button.

When you do so, selected picture will get inserted in the document.

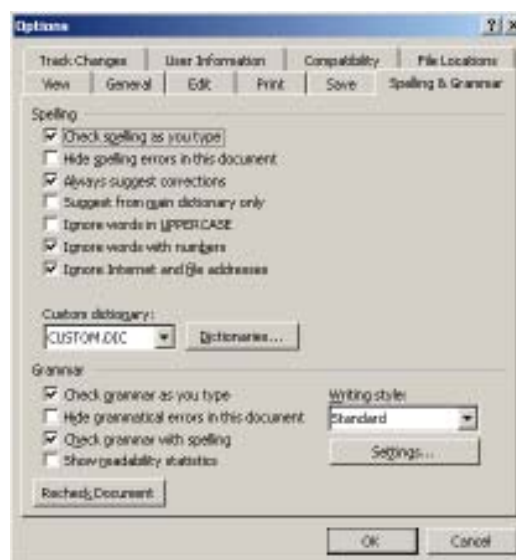
ACTIVATING ON-LINE SPELL CHECKER

On-line spell checker is a facility, using which the spelling of a word is checked, as soon as it is typed. If the spelling is found incorrect, the word is underlined with red zigzag line. If you wish, it could also suggest correct spellings for this word. Note that On-line spell checker marks incorrect spellings, only when it is made on. Perform following steps to switch it on:

1. Select "Tools" option from the Bar menu. When you do so, Tools submenu, as illustrated in figure 6.24 (a), gets displayed on the screen.
2. Select "Options" option from this submenu. When you do so, a dialog box, as illustrated in figure 6.24 (b), will appear on the screen. If somehow the options shown in the dialog box are different than those shown in the figure, click the mouse on "Spelling and Grammar" tab.
3. Check "Check Spellings as you type" check box.
4. Now select "OK" button.



(a)



(b)

Figure 6.24

When you do so, On-line spell checker gets activated. Now, whenever you type a misspelled word, red colored zigzag line automatically underlines it.

CORRECTING WRONG SPELLINGS

To correct the spelling, right click the mouse on wrong spelling. When you do so, a popup menu, containing the list of suggestions, appears on the screen. Correct spelling can be chosen from this list by clicking the mouse on appropriate suggestion.

GRAMMAR CHECKER

MS-Word provides Grammar Checker facility, which can either be activated or deactivated as per requirements. When activated, green color zigzag line underlines all grammatically wrong sentences that have already been entered. After this, when next sentence is typed, grammar checker checks it immediately, on-line.

Grammar checker not only provides the facility to check grammatically wrong sentences but it also displays alternatives to correct them. How grammar checker is activated, how it is made use of is explained below.

Perform following steps to activate the grammar checker:

1. Select "Tools" option from the Bar menu. When you do so, Tools submenu, as illustrated in figure 6.24 (a) appears on the screen.
2. Select "Option" option from this submenu. When you do so, a dialog box, as illustrated in figure 6.24(b) will appear on the screen. If somehow, different options appear in the dialog box, click the mouse on "Spelling & Grammar" tab.
3. Now check "Check grammar as you type" check box.
4. Make sure that "Hide grammatical errors as you type" check box is unchecked.
5. At last click the mouse on "OK" button.

When you do so, Grammar checker will get activated and all grammatically wrong sentences will get, underlined by green color zigzag line.

CORRECTING INCORRECT SENTENCES

As mentioned earlier, Grammar Checker utility of MS-Word, suggests, few suggestions for correcting grammatically wrong sentences. Perform following steps to make use of this facility:

1. Right click the mouse on grammatically wrong sentence. When you do so, a list of suggestions, as shown in figure 6.25, in the form of popup menu appears on the screen.
2. If the wish to accept a suggestion from the list, click the mouse on that suggestion. When you do so, suggested sentence will replace the incorrect sentence.
3. If you don't want to accept any suggestion from the list and wish to continue with original sentence, click the mouse on Ignore button.

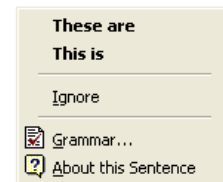


Figure 6.25

In both the cases (mentioned above), you will return back to the document and green zigzag line will get removed.

Using this procedure, all grammatically wrong sentences can be corrected.

INTRODUCTION TO MAIL MERGE OPERATIONS

You are now familiar with the method of typing a letter in MS-Word and formatting it, so that it looks attractive. Now, say, you have to send applications to many organizations for seeking employment. But the question is, if the same letter has to be sent to say 10 or 15

organizations then what do you do? Do you copy the letter to 10 or 15 different files and change the names and addresses of organizations in individual files? No, this is not the right solution. If you are working in MS-Word, it provides a facility called Mail Merge. Using this facility, you can create two different files, one file containing data (i.e. names and addresses of all the organizations) and other containing application (with name and address left blank). After creation of these files, they are merged together, so that one letter is created for each individual. Concept of Mail Merge is illustrated in 6.26.

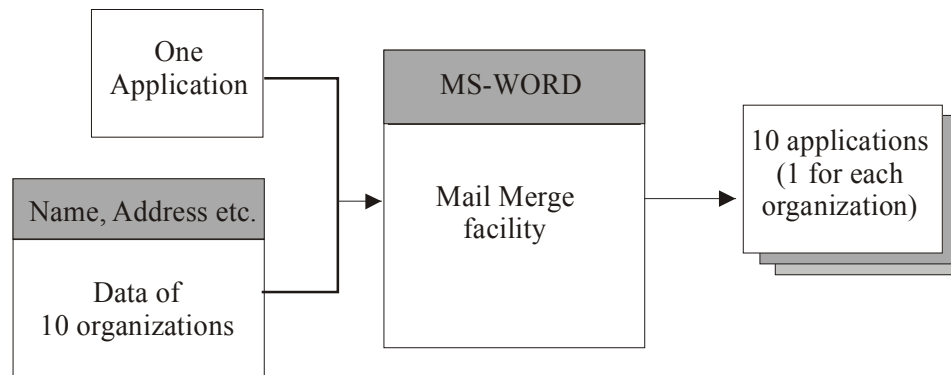


Figure 6.26

TERMS AND TERMINOLOGY OF MAIL MERGE

Before we describe operational details of Mail Merge, it is necessary to get familiar with few important terms and their meanings.

Main Document

Format of the letter, which is to be sent to each individual, is called main document. Refer figure 6.26 and note that application letter format is nothing but main document.

Main document basically consists of two items; one is the text that will appear in the letter (such as "This has reference to your advertisement in newspaper.....") and other are the variables, which will fetch the data (such as name, address etc. of friends) from the data file. How main document is created, is explained later in this chapter.

Data Source

Data source is basically a combination of two items i.e. Header row and Data. Refer figure 6.26 and note that combination of item like name, address etc. and the data is nothing but data source.

Header Row

Those items, related to which the data exists in the data file, constitute header row. For example, if the data in the data file relates to name, address and telephone number of the organizations then these three items put together will constitute header row. Following is an example of header row:

Name, Add, Tel

Here names (spellings) of all individual items of header row and their sequence in header row are important, wherever they will be referred, they will be referred by same name and the data in the data file will have to be put in the same sequence.

Data

Data consists of those values, which are to be included in the letters. For example, if the letters are to be sent to 4 organizations then there will be 4 rows of data. Each row will contain values for each individual organization. Table shown here clearly illustrates header row and data.

Header Row →	Name	Add	Tel
	Sun Infotech	1 Park street Mumbai	2787531
	Tech Art	23 Dover Lane Delhi	2608529
Data →	Mastek	43 Mall Avenu Chennai	23405091
	Electro Magic	69 Broad Street Delhi	26589063

For generating letters through Mail Merge facility of MS-Word, you need to create main document, data source and data, first. After this, data is merged with the main document and letters are printed. Operational details for creating these items are given below.

CREATING THE MAIN DOCUMENT

Perform following steps to create the main document:

1. Select "Tools" option from the bar menu. When you do so, Tools submenu, will appear on the screen.
2. Select "Mail Merge..." option from Tools submenu. On selecting this option, Mail Merge Helper screen, as shown in figure 6.27, will appear on the screen.
3. Click the mouse on "Create" button. When you do so, a drop down list, as shown in figure 6.28 will appear on the screen.
4. Select "Form Letters" option from this list. When you do so, a dialog box as shown in figure 6.29, will appear on the screen.
5. If you wish to create the document in current window, click the mouse on "Active Window" button else click it on "New Main Document" button. In both the cases, Mail Merge Helper screen, as shown in figure 6.30, will appear on the screen.

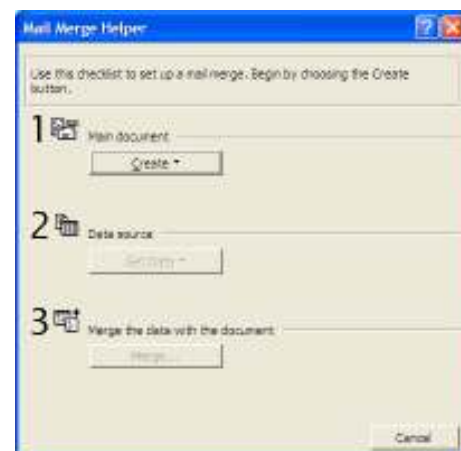


Figure 6.27

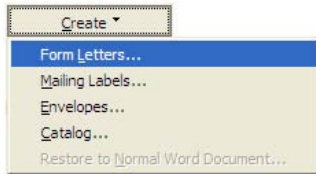


Figure 6.28

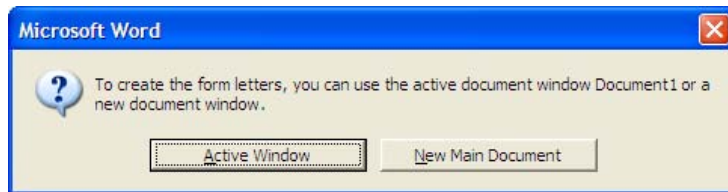


Figure 6.29

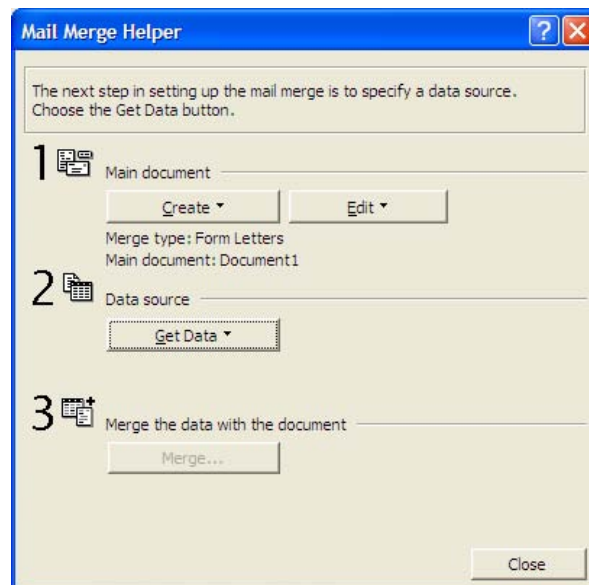


Figure 6.30

Note that main document consists of text and the field names (header row constituent). So in order to create the main document, you will have to write the text and the field names also. But the field names have not yet been created. So let's first create the data source and then create the main document.

CREATING THE DATA SOURCE

Perform following steps to create the data source:

1. Click the mouse on "Get Data" button, present in "Mail Merge Helper" screen (figure 6.30). On selecting this option, a drop down list as shown in figure 6.31 will appear on the screen.
2. Since the Data Source is being created for the first time hence select "Create Data Source" option from this list. When you do so, a dialog box, as shown in figure 6.32, will appear on the screen.

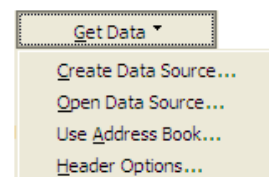
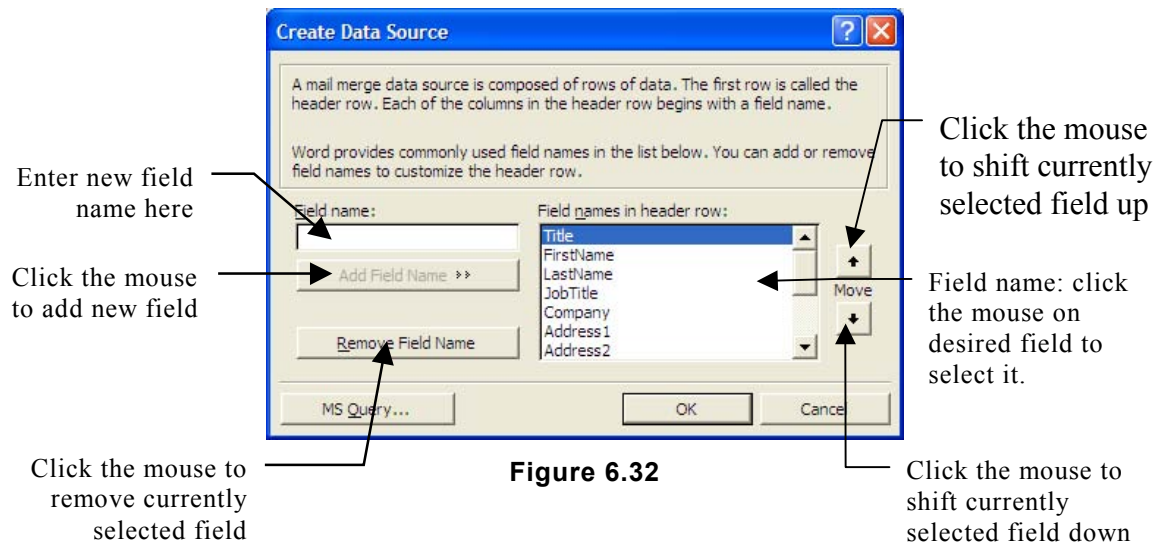


Figure 6.31

**Figure 6.32**

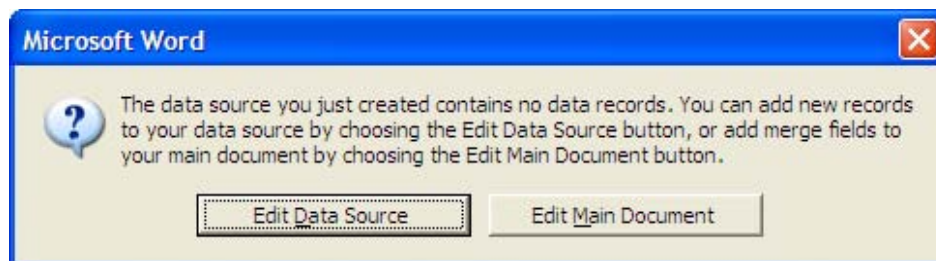
Using this dialog box, create the header row and data, as mentioned below.

Creating Header Row

1. You know that header row consists of field names. Field names currently present in header row are shown in "Field names, in header row" list box. To remove any field from the header row, select the field and click mouse on "Remove field Name" button.
2. To add a new field in header row, enter the name in "Field name" text box and click the mouse on "Add Field Name" button.
3. To change the sequence of the fields in the header row, make use of arrow buttons. For example, say you create the header row with following field names:

Name, Add, Tel

4. Click the mouse on "OK" button. When you do so, usual "File Save" dialog box appears on the screen. Mention drive, folder and file name for saving the header row. Say for example, you specify the file name as "DataRow". To end the saving process, click the mouse on "Save" button. When you do so, a message box, as shown in figure 6.33, will appear on the screen.

**Figure 6.33**

Creating The Data

1. To create the data, click the mouse on "Edit Data Source" button, present in the message box, shown in figure 6.33. When you do so, a data entry form, as shown in figure 6.34, will appear on the screen. This form will have provision for entering the data for all the fields of header row.
2. To enter the data, type the field values in the corresponding text boxes and click the mouse on "Add New" button. It will add a new record to the file and create blank screen for entering the next record.

Figure 6.34

After entering the complete data, click the mouse on "OK" button. When you do so, Mail Merge toolbar, as shown in figure 6.35 will appear on the screen and you will be taken back to the main, blank document, which, you had created at the beginning. Now you need to enter the text and header row field names in the document so that letters for all individuals could be generated.

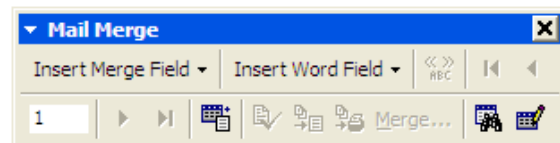


Figure 6.35

EDITING THE MAIN DOCUMENT

Perform following steps to edit the main document:

1. Type the text of the letter, in normal way, as you type the contents of other documents
2. To add the header field name in the text, take the mouse pointer at the place, where the field is to be added and click the mouse on "Insert Merge Field" button, present in Mail Merge toolbar (Figure 6.35). When you do so, header row field name will get displayed, as shown in figure 6.36.
3. Select the field by clicking the mouse on it. When you select the field, MS-Word will put the field name at the current insertion pointer's position as, <<Name>>. Remember that these signs are not less than or greater than signs, they cannot be entered through keyboard. They can only be included through Mail Merge toolbar.

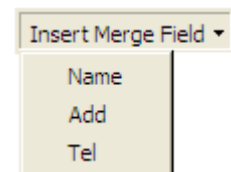


Figure 6.36

Say, for example, you prepare the main document, as shown in figure 6.37.

MERGE DATA SOURCE WITH MAIN DOCUMENT

Perform following steps to merge the data with main document:

1. Make sure that main document file (For example, Invitaton.doc) is there on the screen.
2. Select "Tools" option from the bar menu. When you do so, Tools submenu will appear on the screen.
3. Select "Mail Merge" option from Tools submenu. When you do so, "Mail Merge Helper" screen, as shown in figure 6.30, will appear on the screen.
4. Click the mouse on "Merge" button present in that screen. When you do so, a dialog box, as shown in figure 6.38, will appear on the screen.
5. Using different objects of this dialog box specify printing related details.
6. At last, click the mouse on "Merge" button present in the dialog box.

To

Manager HRD

<<Name>>

<<Add>>

<<Tel>>

This has reference to your advertisement in the newspaper for the post of Systems Executive.

I find myself most suitable candidate for this post. I am sending my resume for your kind consideration.

Thanking you.

Ravi Krishana

Figure 6.37

When you do so, letters for all the persons, will get generated on the screen. If you wish, you can print them on printer in the same way as other document. Sample letters for the example, taken in this chapter are illustrated below.

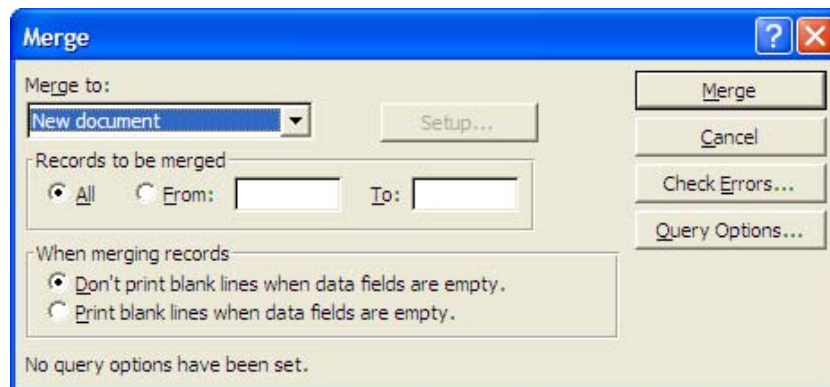


Figure 6.38

<p>To Manager HRD Sun Infotech 1 Park street Mumbai 2787531</p> <p>This has reference to your advertisement in the newspaper for the post of Systems Executive.</p> <p>I find myself most suitable candidate for this post. I am sending my resume for your kind consideration.</p> <p>Thanking you.</p> <p style="text-align: right;">Ravi Krishana</p>	<p>To Manager HRD Tech Art 23 Dover Lane Delhi 2608529</p> <p>This has reference to your advertisement in the newspaper for the post of Systems Executive.</p> <p>I find myself most suitable candidate for this post. I am sending my resume for your kind consideration.</p> <p>Thanking you.</p> <p style="text-align: right;">Ravi Krishana</p>
<p>To Manager HRD Mastek 43 Mall Avenu Chennai 23405091</p> <p>This has reference to your advertisement in the newspaper for the post of Systems Executive.</p> <p>I find myself most suitable candidate for this post. I am sending my resume for your kind consideration.</p> <p>Thanking you.</p> <p style="text-align: right;">Ravi Krishana</p>	<p>To Manager HRD Electro Magic 69 Broad Street Delhi 26589063</p> <p>This has reference to your advertisement in the newspaper for the post of Systems Executive.</p> <p>I find myself most suitable candidate for this post. I am sending my resume for your kind consideration.</p> <p>Thanking you.</p> <p style="text-align: right;">Ravi Krishana</p>

Figure 6.39

PRACTICAL

ASSIGNMENT -1

Prepare a newsletter with borders, two columns text, header and footer and a graphic image and spell check the document.

- (i) Set left and right margins for the entire document (Procedure is given on page 148).
- (ii) Set two columns formatting for the page (Procedure is given on page 156).

- (iii) Type the following text in 11 points, Times New Roman, without caring about its formatting:

The Crossover

A new business opportunity is coming up at the junction of hardware and software embedded technology

An Indian boy selling newspapers at Stockholm railway station was unusual enough for Sunil to investigate. The boy turned out to be a student at the Royal Institute of Technology, Sweden. He talked excitedly about an idea for a pace marker that lasted much longer than the ones available in the market. "Why don't you come and develop this product in my laboratory?" asked Sunil.

The lab is a center of excellence for embedded systems at Tata Consultancy services (TCS) in Bangalore. Sunil had set it up only a year ago, after quitting Sasken Communication Systems. "I had approached TCS with this idea of an embedded systems lab and TCS had agreed," say Sunil. Despite being the largest software services company in India, TCS had not worked on embedded system other than in telecommunications. It was slow off the blocks, but the company was trying to make up for lost time.

Sunil's lab's mandate was not to provide services. It would to research, develop technologies, and build product; not just software but complete devices. Whenever a product came out, it would be sold under the TCS brand name. The first device could be patient health monitoring system. The next one could be a box that would increase spectrum utilisation in CDMA (code division multiple access) networks. The third device could be the boy's pacemaker.

- (iv) Now perform following steps to edit and format the text:
- Find the word utilisation in the document and replace it with utilization (Procedure is given on page 152).
 - Put the heading, "The Crossover" in 24 points bold, Arial Black (Procedure is given on page 153).
 - Put the border around "The Crossover" heading (Procedure is given on page 155).
 - Make the text, starting with the words "**A new business opportunity.....**" till "**embedded technology**" as subheading. Put them in 14 points bold, italic and underlined (Procedure is given on page 153).
 - Import the picture in the document (Procedure is given on page 160).
 - Align the paragraphs (Procedure is given on page 153).
 - Format the document, as shown below.
 - Save the document in a file.

*Technology News***The Crossover****A new business opportunity is coming up at the junction of hardware and software embedded technology**

An Indian boy selling newspapers at Stockholm railway station was unusual enough for Sunil to investigate. The boy turned out to be a student at the Royal Institute of Technology, Sweden. He talked excitedly about an idea for a pace marker that lasted much longer than the ones available in the market. "Why don't you come and develop this product in my laboratory?" asked Sunil.



The lab is a center of excellence for embedded systems at Tata Consultancy services (TCS) in Bangalore. Sunil had set it up only a year ago, after quitting Sasken Communication Systems. "I had approached TCS with this idea of an embedded systems lab and TCS had agreed," say Sunil. Despite being the largest software services company in India, TCS had not worked on embedded system other than in telecommunications. It was slow off the blocks, but the company was trying to make up for lost time.

Sunil's lab's mandate was not to provide services. It would to research, develop technologies, and build product; not just software but complete devices. Whenever a product came out, it would be sold under the TCS brand name. The first device could be patient health monitoring system. The next one could be a box that would increase spectrum utilisation in CDMA (code division multiple access) networks. The third device could be the boy's pacemaker.

Page 1

ASSIGNMENT -2

Creating a table to show the paradigm of the verb "eat" in all 12 tenses.

- (i) Create a table, consisting of 13 rows and 5 columns (Procedure is given on page 158).
- (ii) Select cells (2nd row, 1st column), (3,1) and (4,1) and merged them together (Procedure is given on page 160).
- (iii) Select cells (5,1), (6,1) and (7,1) and merged them together (Procedure is given on page 160).

- (iv) Select cells (8,1), (9,1) and (10,1) and merged them together (Procedure is given on page 160).
- (iv) Select cells (11,1), (12,1) and (13,1) and merged them together (Procedure is given on page 160).
- (v) Type the text in the table, as shown below.

Tense		Present	Past	Future
Simple	He	Eats	Ate	Will eat
	I	Eat	Ate	Will eat
	You/ They	Eat	Ate	Will eat
Continuous	He	Is eating	Was eating	Will be eating
	I	Am eating	Was eating	Will be eating
	You/ They	Are eating	Was eating	Will be eating
Perfect	He	Has eaten	Had eaten	Will have eaten
	I	Have eaten	Had eaten	Will have eaten
	You/ They	Have eaten	Had eaten	Will have eaten
Perfect Continuous	He	Has been eating	Had been eating	Will have been eating
	I	Have been eating	Had been eating	Will have been eating
	You/ They	Have been eating	Had been eating	Will have been eating

ASSIGNMENT - 3

Prepare your Bio-data/Resume.

- (i) Set left and right margins for the entire document (Procedure is given on page 148).
- (ii) Type your details.
- (iii) Format the document.

ASSIGNMENT - 4

- (i) Do the mail merge operation for sending applications to many companies with your resume.
 - Create the main document (i.e. application). Format of the application is shown in figure 6.37 and the procedure for creating the application is given on page 164.
 - Create the data source (i.e. field names and data). Details of data source are given on page 164 . Procedure for creating data source is on page 165.
 - Merge main document with data source to generate applications for many companies. Procedure for merging them is given on page 168.